AVIATION WEEK

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JANUARY 7, 1952

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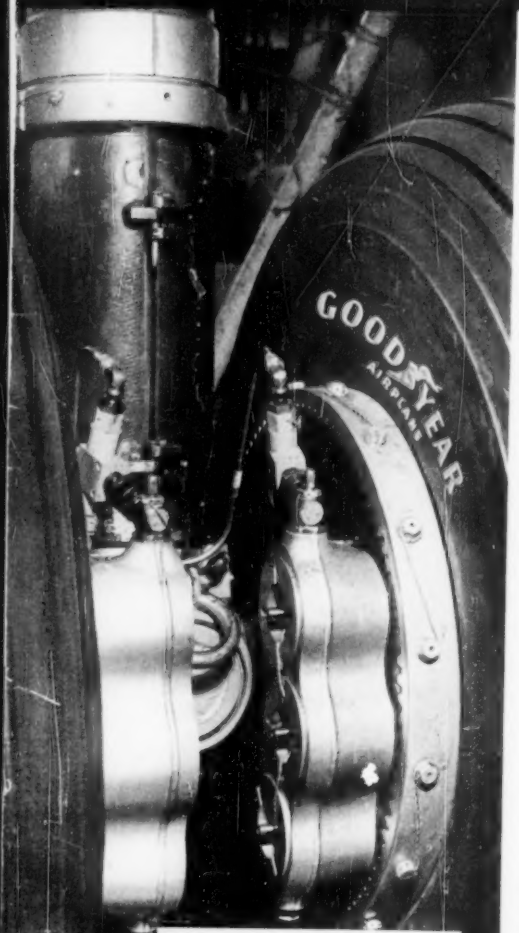

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Aviation Week

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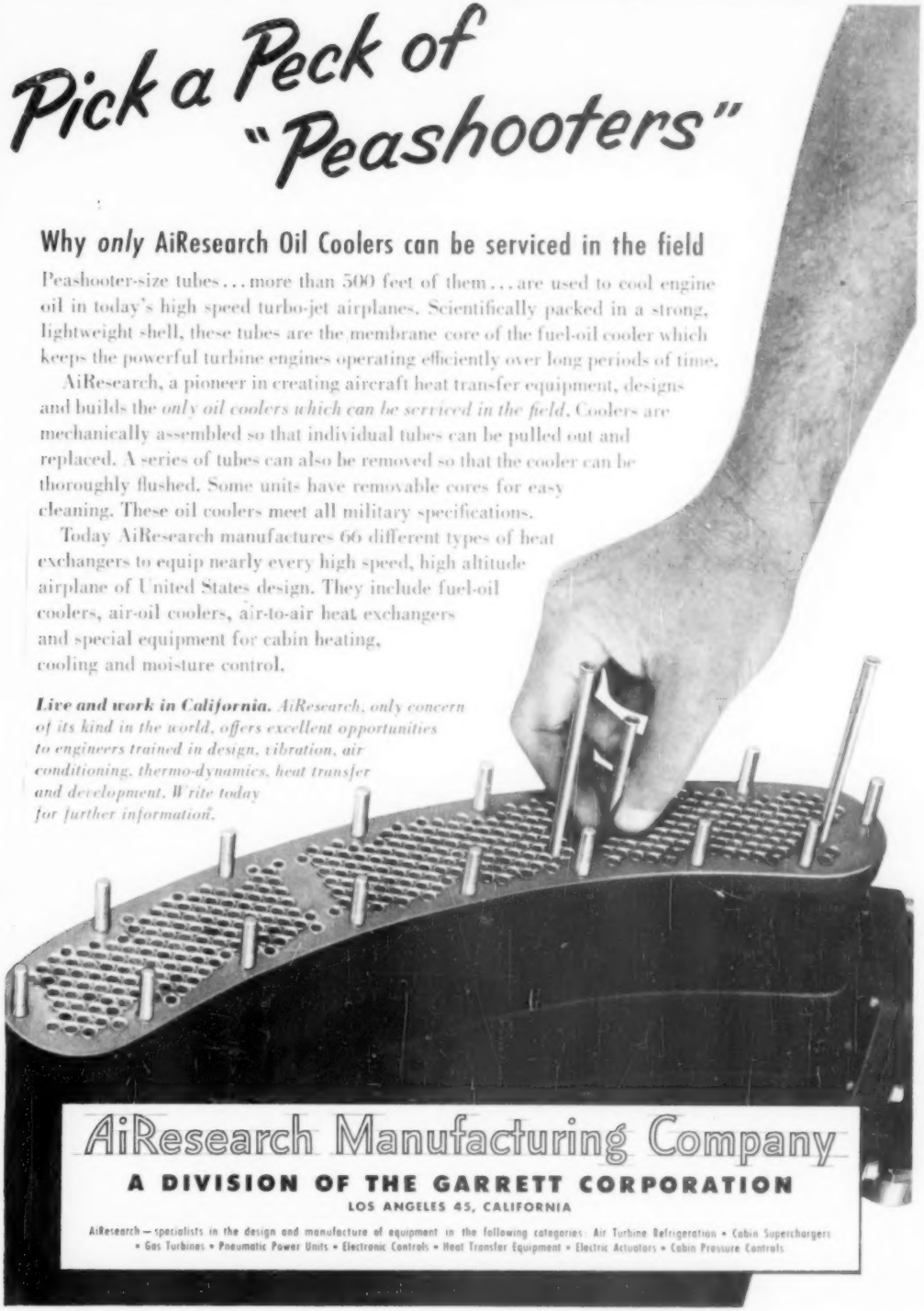

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NEWS DIGEST

DOMESTIC

All-cargo DC-6A service across the Atlantic was scheduled to be opened by Pan American World Airways Jan. 5, leaving from the U. S. on Saturdays and from Europe on Sundays.

Personal and executive plane exports of planes 6,000 lb. and less empty airframe weight, by six companies totaled 33 in November. Value was $250,814, compared with 21 worth $131,054 for October.

Machine tool builders have been authorized a new priority symbol, Z-2, giving them same priority as direct military orders coded A to E on steel, copper, aluminum and components such as bearings, motors and castings. Field offices of Department of Commerce will disseminate information on the new rulings.

Air express shipments in the U. S. increased 7% over a year ago on the first ten months of 1951, to 3,583,543; revenue was up 31% to $25,194,160. October revenue gained 22% to $2,658,398.

Lt. Gen., E. R. Quesada, USAF (Ret.), has been elected vice president and a director of Olin Industries, Inc., East Alton, Ill., and will be connected with the company's expanding cellulose and minerals programs. Quesada once headed up Tactical Air Command and was in charge of Joint Task Force 3, which conducted atomic tests at Eniwetok.

Air defense of Washington, D. C. has been assigned to Lockheed F-94 all-weather fighters of the 121st Fighter-Interceptor Sqdrn. based at Andrews AFB. Defense was previously handled by F-84s.

Personal and executive plane shipments, one-to-ten-place, during November by six companies came to 135 craft valued at $1,019,000. Shipments included 99 four-place-or-more, 33 two-place and 3 one-place.

FINANCIAL

Mid-Continent Airlines reports a net profit of $16,641 after taxes for October, 1951, and a net profit of $182,227 for the first ten months of last year.

Northwest Airlines had operating revenues of $4,022,717 in November, a gain of $638,016 over the same month in 1950. Net income in the 11-month period ending last Nov. 30 after income tax provisions was $1,816,322, with operating revenues of $45,236,522.

Solar Aircraft Co. notes sales of $23,043,000 and net income of $564,800 for the six months ended Oct. 31.

IATA Clearing House, London, reports record monthly turnover of $17,445,000 during October. By offsetting credits and debit balances of its members, Clearing House eliminated necessity for cash settlement of 89% of turnover. For the first ten months of last year, revenue transactions cleared by IATA stood at $137,877,000.

Cessna Aircraft Co., Wichita, reports sales of $26,482,320 for the fiscal year ended Sept. 30, 1951 and military earnings after income taxes were $795,144. Major part of business was military sales, $18,869,842. Military backlog at Sept. 30 was about $80 million.

INTERNATIONAL

Canadian defense orders totaled $977,900 for aircraft and supplies during the first two weeks of November, with largest order, $712,100, going to Irving Air Chute Ltd., Fort Erie, Ont.

First flight of the new de Havilland DHC-3 Otter (formerly known as the King Beaver) was made Dec. 12. Patterned after the Beaver light transport, the larger Otter will have nearly double the payload. It seats 8-14, has a 600-hp. P&W R-1340 giving 145-mph. cruise speed.

Royal Air Force will ferry DH Vampire Mk. 9 unit from England to Singapore to aid in anti-bandit operation in Malaya; ferry pilots will fly back with DH Vampire Mk. 5s, making this the longest jet plane ferry operation carried out by the RAF. Total distance is 17,700 mi. Mk. 9 Vampire is similar to Mk. 5 but has Godfrey air conditioning cockpit equipment. The flight was to begin Dec. 31.

An American partnership which claims it owns 40 former Chinese Nationalist transport planes, had its appeal dismissed by the Hong Kong Supreme Court, which then awarded the planes to Communist China. Whiting Willauer, co-partner of retired Brig. Gen. Claire Chennault, said the case might be appealed to the Privy Council in London. The planes have been impounded in Hong Kong since November, 1949.

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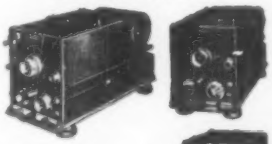

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AVIATION CALENDAR

Jan. 8-10—Upper Midwest Armed Forces Procurement Exhibit showing small businessmen subcontracting possibilities. National Guard Armory, Minneapolis.

Jan. 14-18—Annual meeting of Society of Automotive Engineers; included among the papers will be several on aircraft and aviation; Hotel Book-Cadillac, Detroit.

Jan. 18—American Rocket Society meeting. Dr. M. J. E. Golay, chief scientist of Signal Lab., Ft. Monmouth, will speak on "Radio Ranging in Outer Space." Engineering Society Auditorium, W. 39 St., New York, 8 pm.

Jan. 21-25—American Institute of Electrical Engineers winter general meeting. Hotel Statler, New York.

Jan. 22—Meeting of Institute of the Aeronautical Sciences, Cleveland-Akron Section; talk, "Freight by Air," by T. L. Grace, president of Slick Airways; Cleveland.

Jan. 22—International Air Transport Assn. Technical Committee meeting, Madrid.

Jan. 28-Feb. 1—20th Annual Meeting, the Institute of the Aeronautical Sciences, Astor Hotel, New York.

Jan. 29-31—114th National Meeting of the American Meteorological Society, Roosevelt Hotel, New York.

Feb. 7—Meeting of Society of Automotive Engineers. Igor I. Sikorsky will speak on helicopter programs. Brass Rail Restaurant, 5 Ave. near 43 St., New York.

Feb. 7-8—Regional meeting of Instrument Society of America. Power Plant Symposium. Hotel Statler, New York.

Mar. 3-6—Institute of Radio Engineers, Waldorf-Astoria Hotel & Grand Central Palace, New York.

Mar. 3-7—Spring meeting of American Society for Testing Materials; symposium on testing metal powders and metal powder products; Hotel Statler, Cleveland.

Mar. 17-19—Second Midwestern Conference on Fluid Mechanics, to be held at Ohio State University.

Mar. 17-22—American Society of Tool Engineers, International Amphitheater, Chicago, Ill.

Mar. 21—National Flight Propulsion Meeting, Institute of the Aeronautical Sciences, Cleveland.

Mar. 30-Apr. 3—Convention of American Association of Airport Executives, Ft. Worth.

April 21-24—National Aeronautic Meeting and Aircraft Engineering Display, Society of Automotive Engineers, Hotel Statler, New York.

May 8-9—Fifth annual Wisconsin Aeronautics Conference, Green Bay.

June 9-21—Triennial meeting of International Organization for Standardization; host will be American Standards Assn.; Columbia University, New York.

PICTURE CREDITS

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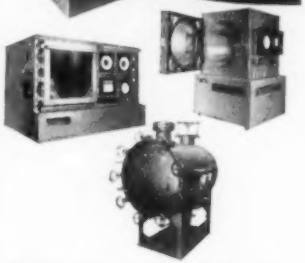

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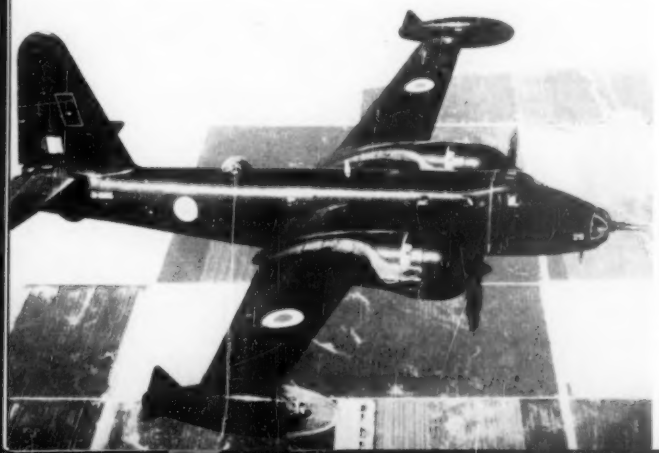
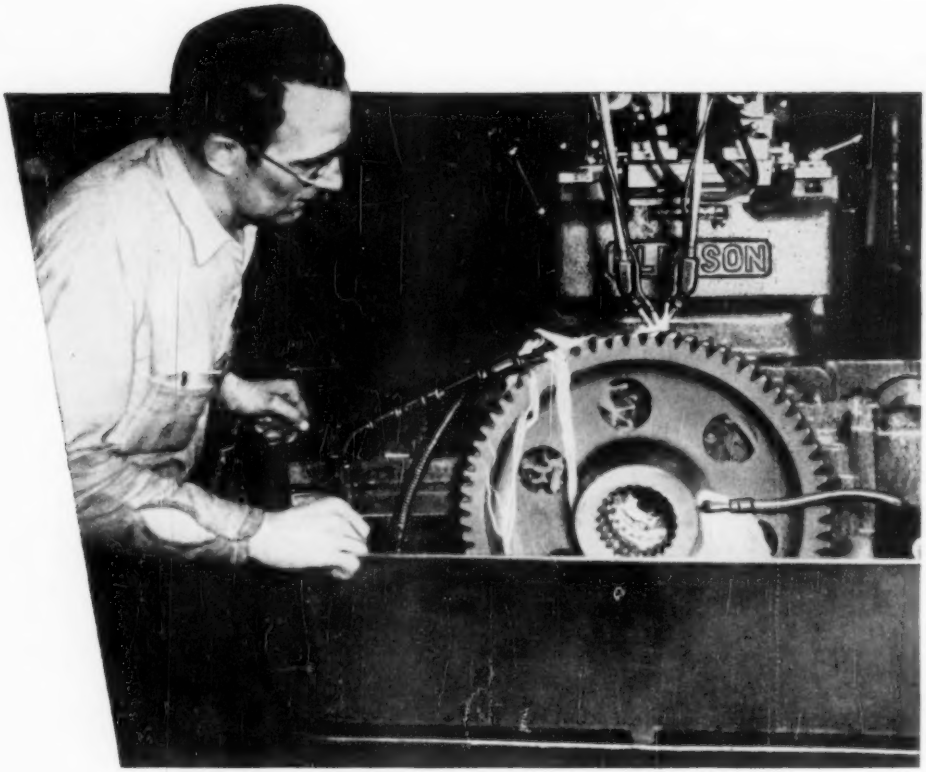
FRENCH JET MODIFIED—SNCASO 6026 Espadon (Swordfish) jet rocket fighter has new air intakes behind landing gear wells, rocket motor installation under the tail, and has tiptanks. Armed with six 20-mm. or four 30-mm. cannon, SO-6026 does about 650 mph.

RESUMES TESTS—French SNCASO M2 research plane (above and below) is flying again with new tiptanks housing outrigger landing gear, modified servomechanisms. It is now powered by a 3,500-lb.-thrust Rolls-Royce Derwent, but installation of rockets is being considered. Speed is over 600 mph.



Military News In Pictures

NEPTUNE FOR BRITAIN—Royal Air Force pilots get in some training time on one of the new Lockheed P2V-5 Neptunes being delivered to Britain and Australia under MDAP. Destined for patrol duties and anti-sub work, the roundel-marked Neptune recalls the rugged World War II Lockheed Hudsons used by RAF for similar work, shows considerable aircraft progress since then.



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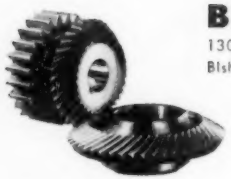

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WHO'S WHERE

In the Front Office

William F. Cassedy, Jr., has been elected president of Aircraft Radio Corp., Boonton, N. J., succeeding **Lewis M. Hull**, who becomes board chairman and remains treasurer. Cassedy previously was vice president-general manager of Kearfott Mfg. Co., Newark, N. J. **Richard W. Seabury**, former board chairman of Aircraft Radio Corp., becomes chairman of the finance committee.

Sergio I. Clark has been named president of Compania Cubana de Aviacion (Cuba), Pan American World Airways affiliate. He succeeds the late **Antonio T. Govin**. Clark, formerly was vice president of Cubana, once was minister of communications. **Dr. Jorge Barroso** has been chosen as a member of the carrier's board.

Frank L. Davis has been made president of D&R Mfg. Laboratories, Inc., a new company formed as the manufacturing division of Davis Developments to produce Davis cargo tie-down gear, cargo-handling and maintenance devices, airline seat belts and other new equipment. Davis was formerly under contract with Air Associates. D&R is located at 1191-5 Spofford Ave., New York 59.

Richard D. Maystead, vice president-manufacturing of Pacific Airmotive Corp., has been appointed director of engineering. Maystead, one of the manufacturing division's early members, started as design engineer, became manufacturing vice president in 1950.

Changes

L. L. Jones has been designated manager of the aviation department, Shell Oil Co. of Canada, Ltd., and **Basil Rabnett**, former aviation manager, has been promoted to a managerial position in the new manufacturing department.

Clarence K. Burnside has joined Prewitt Aircraft Co., Clifton Heights, Pa., as manager of the subcontracting department.

Frank E. Carroll, Jr., is now chief engineer at United Aircraft Products, Inc., Dayton, Ohio. He previously was in the powerplant laboratory at Wright-Patterson AFB.

Ford Eastman, newsman, has joined Northwest Airlines publicity department and news bureau in St. Paul, Minn.

New Board Members

Maj. Gen. Oliver P. Echols, general manager and board chairman of Northrop Aircraft, has been elected a California director of the National Association of Manufacturers.

Albert G. Redpath, general partner of Auchincloss, Parker and Redpath, investment firm, has been named a member of Northwest Airlines' board.

William B. Harding, partner of Smith, Barney & Co., investment bankers and brokers, has been named to the board of governors of Flight Safety Foundation, Inc.

INDUSTRY OBSERVER

► Bell Aircraft Corp. is reported considering licensing a Japanese organization for the manufacture of helicopters. The company now known as the Shinmeiwa Industry Co., is successor to the former Kawanishi aircraft factory, at Nishikamiya, Osaka, Japan.

► The two turboprop-powered Navy Lockheed Super Constellations are to be designated R7O-2s, distinguishing them from the earlier R7O-1 piston-powered Navy Super Connies. One will be assigned to Naval Air Test Center, Patuxent River, Md., for demonstration and Navy tests when they are delivered in mid-1954. The other will remain at Lockheed for continued development tests. Selection of the Pratt & Whitney T-34 single unit turboprop to power the airplane gives the T-34 a new advantage in the important future heavy transport powerplant field over its closest American competitor, the Allison T-40 dual unit turboprop of approximately the same power (5,500 eshp.). The T-34 is now tagged as powerplant for both the Navy Super Connie and the Air Force Douglas C-124B Globemaster, the first two big American turboprop transports on order. Meanwhile the T-40 is having its first innings in the Convair XP5Y-1 multi-engine sea-based transport, and its little brother the Allison T-38 is in the Convair Turboliners, both which have been flying for some time.

► There is some speculation in the aircraft industry that the added power of the new powerplant arrangement for the Lockheed R7O-2 Navy turboprop Super Constellation, may require wing modifications such as sweepback, or thinner airfoil, because of Mach limitation. Many have forgotten however the basic Constellation airfoil was one similar to that used on the Lockheed P-38 Lightning fighter of World War II. And that plane is credited with dive speeds well over 500 mph.

► Canada's part of the North American radar screen will cost approximately $50 million, Canadian Defense Minister Claxton indicated recently in the House of Commons at Ottawa. He said that "satisfactory progress" is being made in completing the screen, and that it takes about two years to build one of the unit stations.

► The F7U-3 Chance Vought Cutlass has more than 100 access doors and panels as a result of thorough re-design of the earlier version for greater accessibility for servicing and maintenance. Engines are removed from the rear, instead of through the bottom of the fuselage as in the earlier F7U-1. Afterburners will be incorporated with the Westinghouse J-46 engines when they are installed but the interim Allison J-35 engine installations do not use afterburners.

► British technical acceptance of the new design trend for water-based aircraft, the blended hull-wing configuration, typified in the Convair Skate water-based jet Navy fighter project is coming fast. A writer in the British weekly, Aeroplane, forecasts that the speed of Mach 0.83, which was reported the maximum reached with the early Saunders Roe SR/A1 jet fighter flying boat, with classic stepped hull "cannot be expected to rise appreciably until the blended-hull design is adopted."

► Ford's Aircraft Engine division at Chicago is swinging into assembly of later models of the Pratt & Whitney Wasp Major R-4360 as its initial production of the R-4360-53 starts to roll. The manufacturer was forecasting completion of the first 26 of its -53 engines by Jan. 15 with its first R-4360-63 engine scheduled out on the same day, and the first R-4360-59 engine to follow by about March 15. From the third -53 engine on, they will be Ford-built except for cylinder heads, it was stated.

► North American Aviation will soon take delivery on a new automatic profiling mill developed by Cincinnati Milling Machine Co., following a demonstration of the machine to the aviation industry at Cincinnati about Jan. 21. The machine was developed as a project sponsored by the Air Materiel Command, and subsequently North American ordered a duplicate machine. Air Force is lending the No. 1 machine to North American in order to get it into a production tryout as promptly as possible. Machine is designed for milling complicated aircraft structural shapes.

Washington Roundup

Manpower Bottlenecks

Manpower problems only started to plague the aviation industry in 1951.

They'll increase this year.

The cold fact is the U.S. doesn't have enough manpower supply for a full-blast civilian and a full-blast military economy. The problem is dividing up a pie that isn't adequate, as military production moves into high gear.

Two most critical shortages with the manufacturing industry now:

• The shortage of skilled labor, needed to produce complicated machine tools, probably will ease some as the industry goes from tooling-up to production.

• But this will bring on a new headache, already being mildly felt by some companies: a shortage of unskilled production workers. It will grow as production mounts over the coming year. In some ways, it's likely to be more trying than the skilled labor shortage, because the unskilled turnover is always big. Recruits from rural areas grow dissatisfied with factory life, or promote themselves to better-paying skilled trades.

• Shortage of engineers, already acute, promises to become more so. Small crops of aeronautical engineers are coming out of colleges. In the slump years for aviation after the war, when military aviation appropriations were kept down, students were discouraged from specializing in the field.

Manufacturers will increasingly have to use ingenuity to avoid having the engineer shortage become a very serious bottleneck to production.

Here are some of the steps being taken, or considered:

• Several aviation companies are sponsoring night courses at nearby colleges, offering students part-time work. Fully experienced engineers are being relieved of elementary jobs that can be handled by the less experienced.

• The industry is eyeing available engineers in Germany, Austria and England. Germany and Austria are banned from revitalizing aircraft manufacturing. New British security law requires five years of residence for employment in defense industries. German aeronautical engineers who went to England after January 1947 are making queries about employment here.

U.S. will likely open its gates to them: House has already passed legislation permitting employment of technical and scientific aliens on military contracts; the Senate is expected to pass it soon.

• Industry may push for a government-subsidized engineering training program. National Science Foundation was set up to do this, granting scholarships and fellowships. But Congress clipped the Foundation's appropriation from $14 million to only $3.5 million for this year.

Air Transport Concern:

• Shortage of control tower personnel threatens to curtail commercial air operations, due for substantial expansion over the coming year as aircraft on order are put in airline fleets.

• Civil Aeronautics Administration already has lost 30% of its airways employes and is confronted with loss of another 20% to the military. No flights have yet been canceled because the airways system was inadequately staffed, but in a few instances flights have been delayed, meaning less efficient service to the public.

Solution lies in getting the military to acknowledge that upkeep of the airways system is vital to defense, and to provide the manpower to keep it going, by deferment or otherwise.

• Pilots and mechanics: Airlines are optimistic that separations from the military services will furnish an adequate pool to draw on over the coming years.

If the military should make another draft on reservist pilots, though, the situation would become critical.

ATA's Turnabout

Congressmen who've been fighting an uphill battle for years for the airlines to get government funds for development of a commercial jet transport prototype sigh at Air Transport Association's turnabout.

ATA President Vice Adm. Emory S. Land's report to the press: "The scheduled airlines of the U.S. do not favor the use of government funds to develop a commercial jet transport plane."

Actually, what ATA's directors voted against: A "direct" government outlay for development of a commercial jet—such as was provided in the old "prototype bill" backed long and strongly by ATA and its individual members.

The vote didn't solve the pending industry controversy: Whether there should be a "construction differential" subsidy to assure that U.S. international carriers don't have to pay more for commercial jets than foreign carriers have to pay for British Comets. It's provided for in legislation Sen. Pat McCarran plans to push early this session of Congress.

• Pan American World Airways is for the "differential." PAA's Vice President Russell Adams' comment: "How do we know we will be able to obtain Comets from Great Britain's limited production? And if we can't, we ought to be able to purchase jets at the same price as the foreign competition."

• Trans World Airline, though, is in opposition. TWA's assistant Vice President Thomas K. Taylor: "We don't want the government control over the type of equipment we're to have that goes with the proposition. It's the manufacturers' problem, not ours. If they can't meet foreign competition and supply us with jets at prices comparable to foreign producers, we'll have to go to the foreign producers. But U.S. manufacturers have always turned out the safest and most efficient planes in the world."

• Northwest Airlines and Braniff Airways are on the fence, weighing the issue.

Here and There

Official Plane Rides. Senate Preparedness Committee's investigation into high-cost plane junketing by military and civilian defense officials is likely to fizzle. Defense Department has a standard comeback: What about free plane trips by members of Congress?

Civil Aeronautics Board is in line for another round of sharp criticism by Senate Small Business Committee in its annual report, due for submission to Congress this week. Committee's complaint: CAB is partial to the scheduled airlines, antagonistic to the nonskeds.

—Katherine Johnsen

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Single Agency to Handle Plane Needs

- **B-products bottlenecks and inadequate priorities for military components have plagued industry.**
- **So new plan will place all aircraft requirements, both service and civil, under one head: APRA.**
- **Combined materials setup should be operating in time to schedule flow of third-quarter 1952 supplies.**

By Alexander McSurely

After nearly a year of entanglements with inter-agency red tape on aircraft materials requirements which have seriously hobbled the pace of air power's expansion, U.S. defense mobilization agencies have elected to take an easier way.

AVIATION WEEK learned last week that the high-level decision already has been made to consolidate in the hands of a single agency the job of handling all aircraft materials requirements, both civil and military and including engines, airframes and components.

Aircraft Production Resources Agency at Wright Patterson AFB, Dayton, O., already the inter-service claimant agency for military aircraft requirements, is getting the additional assignment of dovetailing essential civil requirements for aviation into the APRA military schedules.

▶**Speed Plan**—It looks now as if the combined operation will be rolling in time for the third-quarter 1952 schedules. First-quarter aircraft requirements already have been made up, and second-quarter requirements are being scheduled. They will be completed before the coordinating inter-agency paper work involved in the new APRA setup can be finished.

Government organizations participating in this coordination include: Office of Defense Mobilization, Defense Production Administration, its Aircraft Production Board, National Production Authority, its Aviation division. The new Office of the Expediter of Military Production, the Munitions Board, the Defense Department and its three components (Air Force, Army and Navy), Air Coordinating Committee, CAA Office of Civil Aviation Requirements and finally APRA. APRA is the materials claimant agency for all three military departments under policy direction of the Munitions Board.

Not yet clear under the new setup are the places to be assigned to the CAA Office of Civil Aviation Requirements and the Aviation division of NPA.

▶**New Procedure**—Presumably the CAA office will continue collecting materials requirements from manufacturers for their scheduled essential civil production. And these will be turned over to APRA for consolidation with its military requirements.

Until now, however, the procedure has been for the CAA office to pass its claims to the NPA aviation division for civil airframes and engines; and the NPA division also has handled scheduling for so-called "B-products" aircraft components lumped together whether military or civil.

It was the bottlenecking on the B-products, and the failure to provide adequate priorities for military aircraft components materials which brought steadily growing pressure for a simplification of the materials controls structure. Whether the NPA division now will be by-passed entirely, and eliminated, or whether some arrangement to preserve it will be made is a decision which has not yet been spelled out.

▶**The Plan**—At any rate the plan that top-level aircraft and defense mobilization planners now have agreed upon is for APRA to ask for and get as many tons of each controlled material as needed each quarter for essential overall aircraft requirements, with a minimum of the time-consuming quadruplication of agency effort, which has been too evident heretofore.

This plan essentially is patterned after the operation of the Aircraft Scheduling Unit of World War II, which worked very well from an overall standpoint.

It is based on three assumptions, which nobody on the top defense levels can any longer deny:

- A small continuing civil aircraft production is essential to maintain the nation's vital air transportation network.
- Approximately 95% of all U.S. aircraft production is for military aircraft.
- It is virtually impossible to segregate efficiently the small amount of civil aircraft production remaining and to regulate materials for it separately, without

Airline Parts Plan Set Up

Airlines now have an emergency procedure set up by the CAA Office of Aviation Defense Requirements, so that no airliner will be grounded for lack of spare parts so long as those parts are available from military stocks or contractors. The plan was announced by Air Force Undersecretary R. L. Gilpatric and CAA Administrator C. F. Horne. Growing tightness in supply of engine parts for planes of the nation's airlines hastened setting up the procedure.

CAA's defense office (OADR) is the sole office for the airlines to call on if faced with a parts shortage that would ground a plane. But Air Force is the authority that will make available emergency spares for airliners under this plan. Navy will release parts through the Air Force.

Air Force has delegated to CAA the job of screening emergency applications to make sure the threatened shortage would ground the airliner, and that all other sources for the scarce part are bare. Where supplies available are less than airliner and military needs, CAA will decide relative priorities among the airlines.

Air Force will make the scarce parts available either by diversion of contracted deliveries or by direct sale from Air Force stock. The announcement notes, however, that parts will be made available "only when such diversion or sales would have no adverse effect upon the Air Force's parts supply program."

slowing up the high-priority production programs on military aircraft.

The first two of these statements are generally accepted, but it has taken several painful months of efforts to separate civil from military aircraft production, requirements-wise, before some of the mobilization agency heads accepted the third.

▶**Similar Transports**—An important factor in the difficulty of separation between civil and military aircraft production is that there is basically little difference between the two in the transport category. The military services have sizeable orders for military counterparts of the Douglas DC-6, Lockheed Constellation and Convair 340 commercial transports, which are going down the same production line as new commercial transports on order.

Parts in many cases are interchangeable, at a considerable saving in production efficiency for both military and civil customers. And any separate effort to regulate the materials for the civilian transports, hits the military, too.

Similarly, the relatively small quantity of civil aircraft components still being produced is inextricably woven into the larger production of military aircraft components. And the attempt to classify a large portion of these as "B" products under civilian regulation has had a delaying effect on increased production of the military components.

A portion of this delay has not yet been felt to its fullest extent but will carry forward well into the latter part 1952, some industry observers forecast.

The haunting specter of lines of almost-completed military airframes lined up outside plants, is a prime mover in getting the new system approved.

The third category of continuing essential civil aviation production, the so-called lightplanes for business and agricultural use, bulks so small in the total materials picture that it makes little appreciable difference to include it, too, with the military production.

However, as long as it is separated, it too runs into scheduling problems out of proportion to the size of the program involved, and effects similar military small aircraft production of liaison and light personal transport planes.

Shortly after APRA was first put into operation last March, the CAA Office of Civil Aviation Requirements laid plans to establish liaison representatives at Dayton to work with the APRA scheduling officers.

This plan was dropped, however, when it was discovered that the planning called for civil aviation requirements to be handled through NPA, separately. Presumably a new liaison setup between the CAA office and APRA may be instituted when the new program reaches operating stage.

No Hoarding

• Industry gets clean bill on aluminum inventories.

• Primes report difficulty in meeting suppliers' needs.

The U.S. aircraft industry has been given a clean bill of health by the Senate Small Business Committee after thorough investigation of charges of aluminum hoardings.

It's report concluded:

"The Committee found little evidence of excessive inventories in the aircraft companies investigated. There seemed to be a strong drive to maintain inventories at the lowest practical levels. Officials pointed out repeatedly that money tied up in inventories is 'dead' money and that the financial situation in the aircraft industry is sufficiently tight to maintain constant pressure against tying money in stocks beyond the most immediate needs.

"None of the companies surveyed by the committee reported having any serious difficulty securing primary aluminum for their own needs, although they all had the problem of obtaining materials for the supplies of components."

▶**What They Found**—Most of the report was an explanation of the factors accounting for what large stocks of aluminum investigators did find. Among the reasons: deceleration of production due to re-scheduling, production changes, strikes.

On individual companies, the committee reported:

Boeing Airplane Co. "The aluminum inventory . . . has been falling steadily over the past year. . . . This sharp decline can be explained in part by a slight drop in consumption. However, in general, it indicates a far tighter control of inventories."

Consolidated Vultee Aircraft Corp. "The San Diego division . . ., while showing a tremendous increase in aluminum supplies on hand, has cut its inventory in half in proportion to production, over the past year. At the Fort Worth plant, inventories have almost doubled, but consumption has risen at a far higher rate. There has been a significant drop in the time required to exhaust inventories. . . ."

Douglas Aircraft Co. "Although stocks of aluminum have increased substantially at all the Douglas plants . . . the increase has closely paralleled the increase in production. . . . Inventory control at Douglas is particularly good."

Lockheed Aircraft Corp. "Because of a radical re-scheduling of its aircraft production program, Lockheed's inventories were badly out of balance during the third quarter of 1951. For the year of 1950 the entire production inventory turned over at the rate of 4.89 times for the year, a commendable achievement in view of the 12 major models produced.

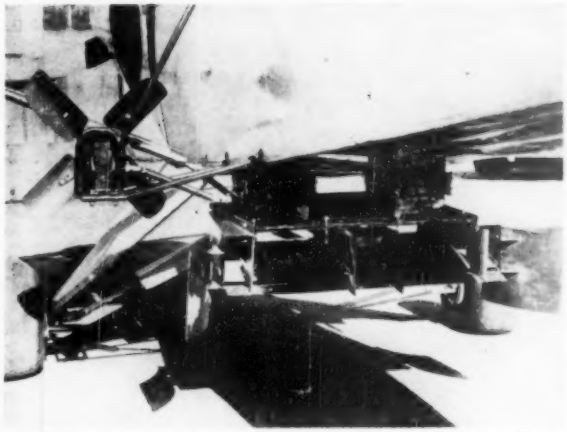
"Thus, moving from one of the tightest inventory-control positions in the industry during the first quarter, the manufacturer received two serious cutbacks in its orders, which left it with proportionately high stocks. . . . This situation was not the fault of Lockheed, but rather the result of the major change in the production program. Lockheed has moved swiftly either to cancel existing orders or delay scheduled deliveries of aluminum until the inventory has been worked out."

North American Aviation. "With consumption up about 20% over the first quarter, North American has reduced the time required to exhaust inventories on hand from 72 days at the beginning of the year to about 50 days currently."

Northrop Aircraft. "Northrop's inventories have increased at a 50% greater rate than consumption since Korea. This is partly because of a very rapid expansion in production, but tighter inventory controls seems to be indicated."

ALL-PURPOSE SIGNS

Transport Workers Union may have been caught by surprise when ground and flight employes of Pan American World Airways struck the week before Christmas. Some signs carried by pickets appear to be left-overs from American Airlines strike, with the word "Pan" painted across the top. Result was a picket sign against "Pan American Airlines."



PIPER PA-18-A's dust dispersal unit provides wide, penetrating swath; spray booms (right) are hinged for safety.

Piper Shows New Agricultural Plane

Piper Aircraft Corp., which for several years has been intensively developing the light agricultural airplane, has come up with the new PA-18-A, said to be capable of spraying up to 220 acres in 45 minutes with a single load of chemicals. This feat has been made possible by considerable interior redesign and new Piper equipment which nearly doubles the spray-dust capacity of previous models.

The PA-18-A is just beginning to come off the lines at Lock Haven, Pa., and made its debut at the Miami Air Show, Jan. 5-6.

Some measure of the craft's load-carrying ability may be gained in considering its 2,770-lb. gross weight and empty weight of 840 lb. During trials, Piper engineers have flown the prototype at a 3,000-lb. gross weight.

Principal modification is rework on the rear fuselage to accommodate an 18-cu. ft. tank having an effective capacity of 110 gal. This tank, located behind the pilot, can be removed through the airplane's turtledeck to permit stowage of cargo. The turtledeck has been flattened and reinforced, the entire bottom of the fuselage is now covered with aluminum sections, easily demountable. The detachable metal covering permits easy inspection and washing down after spraying operations are completed. Also, the fuselage has been vented to avoid collection of poisonous dust or fumes.

For spraying, the plane has a streamlined Piper boom under each wing, having 12 spray nozzles. Booms are hinged to swing back and up should they strike anything, thus lessening the possibility of damage to the booms or the aircraft.

The dust unit has both slots and scatter plates, useful in providing a wide swath and good penetrating effect. Double agitators at the bottom of the hoppers make for uniform flow of dust.

A liquid level gage is fitted to the righthand side of the windshield to give the pilot an accurate count in gallons in level flight and on the ground. Safety features include sharp leading edges on the landing gear to cut wires, extra-heavy safety belt and shoulder harness.

How We Looked to SBAC Tourists

British visitors were impressed by what they saw, but wonder how they can apply it to their own problems.

By Nat McKitterick

(*McGraw-Hill World News*)

London—"It looked as though all the aircraft in the world were being built."

Such was the reaction of one of the 12-man team from the Society of British Aircraft Constructors which toured the U.S. and Canada recently as the guests of the Aircraft Industries Assn.

Guided by USAF and Navy brass in a MATS C-54, the group finished its two-week, coast-to-coast tour awed and not a little envious of the U.S. plane-makers' plant and full of kind words for American hospitality.

▶**Tools, Layouts**—New machine tools, particularly in our California plants, drew a good deal of comment from the production-minded visitors. And it wasn't just the spanking new tools, like Lockheed's 34x10-ft. skin miller and the company's Cecil wing press that impressed. The visitors also marveled at the multiplicity of machines like the Hufford stretch press, which are still very rare items in the British industry.

Management men on the team were equally impressed with the efficient plant layouts they saw and the close cooperation between labor and management. "You don't have to resort to piece-work schemes like we do . . ." one visitor commented.

Incentive, or better the availability of things to spend your money on, was credited for a large portion of this very significant difference between British production practice and that employed in the U.S.

One visitor, noting the frequency with which executives in U.S. aircraft firms changed jobs, concluded that the financial incentive worked as well with management as with labor. It is not often so in austerity England.

▶**What They Learned**—There was much less agreement about what Britain could adopt from American production practice.

The wide use of 75S aluminum alloy in the U.S.—"We saw it being used up to 80% in places"—held a lesson for Britain, most agreed. Production of the alloy in Britain now is insignificant.

One visitor thought tools, like those at Lockheed, which machined large sections of an aircraft out of solid ma-

terial were going to be indispensable to the production of supersonic aircraft in the future. "They allow the designer to reduce weight."

But others, closer to the economic problems of the British industry, had doubts about Britain's ability to use many of the new machines. Main reason: Orders going out to the British industry are not big enough to warrant the huge expense involved in modern tooling.

The visitors were most envious of how their American counterparts seemed to be swamped with orders.

► **Too Costly**—Under the regulations of the Mutual Security Act, Britain is only eligible for U.S. arms aid in items that Britain cannot make—or cannot make in time—by itself. One visitor thought the British aircraft industry could not afford the newest machines tools. Commenting on the materials squeeze in Britain, he added, "How can we afford a machine which mills away 65% of the material before the piece is turned out?"

At the same time one man, who visited Curtiss-Wright to see how they were turning out the British Armstrong Siddeley Sapphire turboject, found that redesigning had reduced the cost of a major component from $1,960 to $1,120. The carefully machined British forging, with a high content of very skilled labor, had been transformed into two concentric rings with welded webs. The British were told that the U.S. company didn't have the kind of labor to duplicate the A.V.S design even if they wanted to.

The visitors found the pattern of shortages and delays in the U.S. industry about the same as in Britain. Deliveries on forgings in the U.S. ranged from six to 12 months as against nine to 12 months in England. There was one significant difference: Labor is far tighter in England.

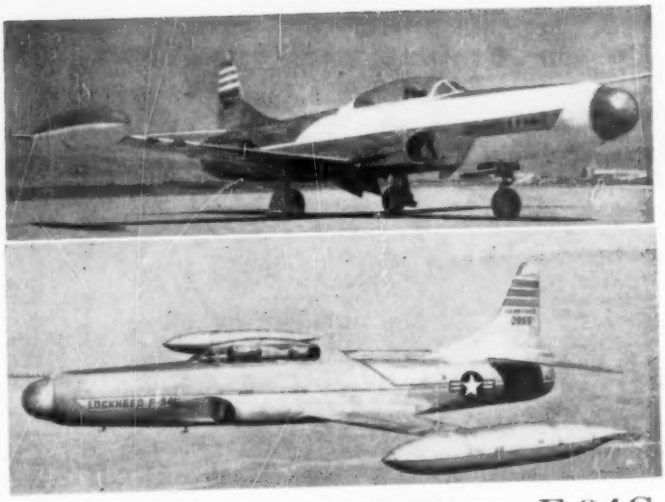
The consensus was that this near parity won't last. Some day deliveries are going to be tumbling out on top of one another in the U.S. That isn't at all likely in Britain, judging by the paucity of orders placed so far. The problem transcends Britain's aircraft industry. The British are trying to get more out of essentially the same old horse; in the U.S. the problem is just to get more.

► **Research Comparison**—The visitors marveled at the lavish spending on both production and research in the U.S. The team was particularly impressed with the breadth of research going on at Wright Field and NACA-Cleveland.

One visitor was told that only half the research projects originated in the Pentagon; the rest grew out of officers "with an idea" at some research establishment—"sometimes awfully junior officers, too." To an Englishman, who must make every penny in his tight research budget count, all this seems a bit like fairyland.

Another visitor questioned whether huge spending on some types of U.S. aircraft now in production was really justified. He, like most of his countrymen, had his mind on future operational requirements. Right or wrong the British firmly believe that they are at least as far ahead as the U.S. in designing the aircraft of the future.

It is an endless argument within the British industry itself about when it's time to stop designing aircraft for the future and start ordering some for the present. The best that can be said is that the British consider their designs their best foot forward, while they feel the U.S. champions its production.



Rift in Secrecy Veil Bares F-94C

Photographs of one of the Air Force's still-classified aircraft, Lockheed's F-94C, which three times were denied to AVIATION WEEK by the manufacturer on the grounds that the Air Force had not authorized their release, have appeared in a British publication in a familiar example of holes in Air Force's security curtain. (See editorial "The Lid Is Still On," p. 75.)

"Jane's All the World's Aircraft" published two photographs (reproduced above) of the F-94C, pointing out that this was the "second prototype." The first prototype, or more correctly a modified B model to test features of the C, was pictured in AVIATION WEEK June 25.

The photograph of the modified B was published over the protests of Lockheed which insisted the airplane did not actually resemble the C model. Because of this, AVIATION WEEK twice before had accepted the manufacturer's request not to use the photo, even though it had been published in the annual report of the company manufacturing the engine of the F-94C.

AVIATION WEEK decided to publish the photo of the modified B only after the Air Force included it in a batch of cleared photos which were to illustrate an engineering story on the F-94.

A Lockheed representative concedes that the photographs published in Jane's were taken by Lockheed in preparation for a release that was never authorized by the Air Force. And, although the designation "F-94C" is painted on the airplane, he says the airplane pictured in Jane's is not the final version of the C, and that further changes in the plane are being made.

In several notable past incidents, British publications have been first with photos and details of U.S. airplanes that were still classified by our military services. An outstanding case was publication in a British aviation magazine of photos and details of the Martin P4M at a time when the plane was strictly hush-hush over here. An investigation disclosed that the material had been given to the British magazine by a U.S. military attache in the London Embassy.

The airplane shown in Jane's as the F-94C differs from the F-94B principally in the appearance of the nose, which is longer and blunter. It also has a larger dorsal than earlier versions, larger tiptanks, and the horizontal tail surfaces are faired into the fuselage. It has swept tail surfaces, thin wings, and is powered by a Pratt & Whitney J-48 engine.

Second C-46 Crash Spurs CAB Study

While CAB field men investigated the second nonsked Curtiss C-46 fatal crash in two weeks, civil aeronautics authorities in Washington studied the whole C-46 picture, including weight limitations.

In the second accident, a Continental Charters' Commando with 40 aboard crashed near Little Valley, N. Y., Dec. 29 killing 26 en route from Pittsburgh to Buffalo. Earlier, 56 lives were lost in the crash of a Miami Airlines Commando in Elizabeth, N. J. (AVIATION WEEK Dec. 24, p. 54).

Observers speculated that the coincidence of C-46 crashes, coupled with a personal trip to the crash scene by CAB Chairman Donald Nyrop, may mean the Board will take some action on the CAA proposal to reduce allowable gross load of the C-46 in passenger operation. Preliminary investigations indicated, however, that neither of the two mishaps involved the loading question.

"We are and will continue to take a most careful and cautious check on the whole safety picture of the C-46 as well as other operations," Civil Aeronautics Administrator Charles F. Horne told AVIATION WEEK. "But we're not going to go off half-cocked and hasty when suddenly there are two crashes in a row from apparently different causes," he added. "The nonskeds were doing a good job on safety improvement," he said. "Now comes this accident rash."

A Civil Aeronautics Board source told AVIATION WEEK he had no knowledge of any try by Continental's pilot to communicate with the ground during the flight although all communications west of the Mississippi and as far north as Canada had been checked.

CAB was still studying the crash Dec. 16 of the Miami Airlines C-46 near Elizabeth, N. J., killing 56.

Public hearings on the Elizabeth crash will open Jan. 10. With heater or brake trouble apparently ruled out as the cause of this accident, investigators were concentrating on the right engine.

White House Action Averts Boeing Strike

Prompt White House intervention has averted a strike scheduled to have started Jan. 2 at Boeing Airplane Co., Wichita plant for 16,000 workers involved in the high-priority B-47 six-jet bomber's production.

Acting Dec. 28, President Truman issued requests to both the company and the union for referral of the negotiations on an International Association of Machinists contract, to the Wage Stabilization Board. He received assurances that work would continue, pending action of a panel to be appointed by the board. A tripartite panel was to be named late last week and hearing date set on the negotiations, probably some time next week.

Union members involved represent about two-thirds of the total of 23,000 workers at the Wichita plant.

The union's previous contract expired Nov. 6. It is asking wage increases of 5 to 17½ cents an hour in various job classifications as compared to a company offer of increases of 5 to 12½ cents an hour. The union request seeks to make rates uniform with those it has at Boeing's Seattle plant, and at Douglas' Santa Monica and El Segundo plants. Douglas rates are the highest in the aircraft industry, the union says.

Other major demands of the union: a union shop, automatic progression within the wage rate ranges, and retroactive application of the wage increase to Nov. 6.

Nonsked Airline Suspended by CAB

The Civil Aeronautics Board has suspended operation by New England Air Express, a nonscheduled airline, "until the carrier shows that the rights of the public will be protected in its operations."

The Board points out that the president of the line, Richard Olivere himself admits enough of the earlier charges by CAB against his operation to justify immediate suspension of his letter of registration by CAB.

Among the cases cited as admitted are transcontinental flights that dumped passengers short of destination, without refund after protracted delays en route. Delays, the management explained, were largely because the carrier didn't have enough cash to get the plane serviced en route.

Airline Revenues Top $1 Billion in 1951

The U.S. airline industry took in over a billion dollars revenue in 1951, reports Air Transport Assn. research director Dr. Lewis C. Sorrell. This was 21% over 1950—the previous record year.

Passenger business accounted for about 80% of all U.S. airline operating revenues of $1,043,334,812. This includes scheduled trunklines, international lines, all-cargo lines, locals and non-scheduled airlines.

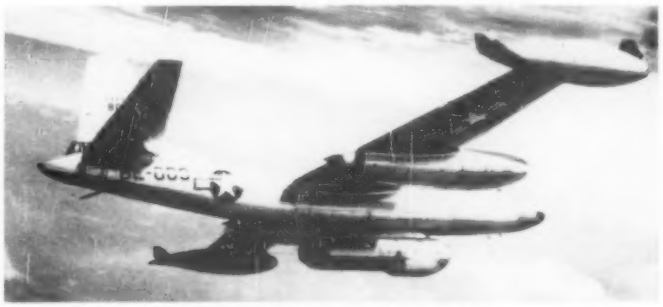
Here are ATA-estimated revenues for each type airline operation in 1951, and percent change from 1950:

- **Domestic trunklines:** $657,294,363—up 25%.
- **Local service lines:** $35,924,529—up 28%.
- **International lines:** $278,915,920—up 8%.
- **All-cargo airlines:** $16,700,000—up 58%.
- **Irregular carriers:** $54,500,000—up 52%.
- **Total U. S. air transport:** $1,043,334,812—up 21%.

Passenger miles gained 29% over 1950; about 25 million people traveled 14 billion passenger miles. That's for all types of U.S. airline.

Taking all U.S. airline operations together, here is how the revenue came in:

- **Passengers** $801,579,823—up 27%.
- **U.S. Mail** $114,474,209—down 3%.
- **Cargo** $91,310,544—up 23%.



TORNADO TESTS TURBOJETS

General Electric has begun operating this North American four-jet B-45 as a flying test stand for the company's turbojet flight testing program. A specially designed housing under the bomb bay will accommodate turbojet engines "considerably larger than any yet announced," and is partially retractable when not in use. The flying laboratory made its first flight several months ago, is now based at GE's flight test center at Schenectady County airport, N. Y., along with several other aircraft used in the various phases of flight testing of aircraft equipment.

FINANCIAL

Domestic Airlines' Earnings
Estimated 1951 vs. 1950

CARRIER	NET INCOME (Millions Omitted) 1950	1951e	% Increase or Decrease	EARNINGS PER COMMON SHARE 1950	1951e
American	$10.40	$10.18	−2.2%	$1.89	$1.86
Braniff	1.23	1.55	26.0	1.23	1.55
Capital	1.07	1.77	65.2	2.02	2.26
C&S	0.86*	0.94*	9.3	1.65*	1.55*
Colonial	(0.31)	0.39	—	(0.60)	0.75
Continental	0.19	0.32	68.4	0.62	1.05
Delta	0.82	1.92	134.1	1.65	3.85
Eastern	5.26	7.19	36.7	2.19	3.00
Mid-Continent	0.36	0.19	−89.5	0.85	0.45
National	0.56	2.35	319.6	0.56	2.35
Northeast	0.42	0.30	−27.3	0.52	0.40
Northwest	(0.14)	1.29	—	(0.71)	1.49
TWA	6.49	6.06	−7.1	2.68	2.50
United	6.43	9.09	41.4	2.81	3.90
Western	0.79	1.31*	65.8	1.50	2.50*

*NOTES: e Estimated; * Includes non-recurring profits; — Decrease; () Deficit.*

Domestic Trunk Net to Set Record

And for the first time airline traffic—10.1 billion revenue passenger miles—will exceed Pullman travel.

The air transport industry is one of the few to show higher net earnings for this past year as compared to 1950 and prior periods. As a matter of fact, 1951 net earnings, after taxes, for domestic trunk airlines are estimated at more than $48 million, a new all-time peak. This compares with $36.5 million for 1950 and $20 million for 1949.

Significantly, first class Pullman travel, with an estimated 10.1 billion revenue passenger miles, was surpassed for the first time in history by the airlines in 1951.

This gain in trunkline net earnings, after heavy tax imposts, was made possible by a 32% rise in revenue passenger miles flown last year. The total was 10.5 billion, also a new all-time high.

► **Growth Factors**—Speed, comfort and an improving safety record have all combined to attract new air travel converts. Increased dependability of airline operations in all types of weather has also been an important factor in developing wider public acceptance.

Air traffic trends have been accelerated by the current rearmament effort. Travel to expedite war contracts has created substantial new business. Travel of servicemen and their families to and from military installations has also been a potent source of airline bookings.

Promotional efforts to stimulate air travel have, thus far, been relatively limited. Where tried, however, their impact has been considerable. Air coach, vacation and off-season fares have broadened available markets.

In fact, air coach now represents from 10 to 25% of the total passenger traffic for a number of trunk airlines.

One of the biggest stimulants to air travel in 1952 is likely to come through the broadening of air coach service under Civil Aeronautics Board prodding. The lowering of the fare structure will also mean that gross revenues will fall short of matching the increases in passenger traffic. (Existing coach fares average around 4½ cents a passenger mile as compared to the standard 6 cents for regular service. The Board suggests a reduction to 4 cents for certain air coach flights with some carriers proposing 3½ cents.)

► **Costs Rising**—This deteriorating fare structure comes at a time when unit operating costs, which have been trending downward, have reversed themselves and have started to climb upward.

Rising costs of various types have had their effect. For example, wage increases have been granted pilots, mechanics, agents, and other employe groups. With wages and salaries averaging around 50% of the total airline costs, these increases contribute a substantial burden for the industry to absorb. Price of gasoline, materials, and spare parts has also risen sharply during 1951.

Expanding traffic has also dictated ordering of new aircraft fleets. This means large capital expenditures which, for the most part, have been financed largely from current earnings and bank loans.

These impending heavy capital requirements have dictated that airline managements strengthen their financial structures through higher depreciation rates and other charges, where possible, against current high earnings. This may make for exceptionally heavy 1951 year-end adjustments among the airlines.

► **Year-End Adjustments**—The accompanying table reveals our estimate for 1951 final earnings for the domestic trunk airlines. It can be seen that the gains in net income, even after high taxes, have been substantial for the industry but rather mixed for the separate airlines.

Any estimate for 1951 final results is subject to many hazards in view of year-end adjustments and other unknown elements such as mail pay.

Nevertheless, with the usual qualifications, these estimates are advanced together with 1950 comparisons.

American Airlines' 1951 report may cause some surprise, with earnings slightly lower than in 1950. Despite a record-breaking year in traffic, the trend of rising costs and year-end adjustments kept earnings down. For about three and a half years American was able to reduce its revenue ton mile costs but a reversal is believed to have taken place during the second half of 1951.

For its system as a whole, American's revenue ton mile cost averaged 54 cents for 1948. This declined steadily to 38.8 cents for the twelve months ended June 30, 1951. However, for the twelve months ended Sept. 30, 1951 the average cost reversed its downward trend and started upward to hit about 41 cents per revenue ton mile. This average cost is believed to have been even higher for all of 1951. Moreover, during 1951, load factors were at abnormally high levels, tending to minimize rising cost elements.

Results for the other carriers reveal varying degrees of profitability with new peaks established for 1951. Non-recurring profits on the sale of capital assets and mail pay adjustments also temper results for a number of airlines. On the whole, the industry can feel pleased with its earnings accomplishment of this past year.

—Selig Altschul

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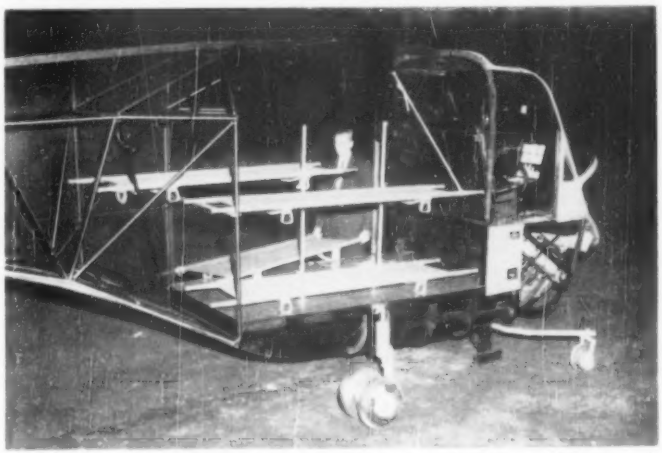
Details of Doman's New Copter Revealed

● LZ-5 features hingeless rotor system; carries 4-6.

● Army plans evaluation tests of new design.

By Irving Stone

DOMAN LZ-5 (model) will be built for Army Field Forces, also as 4-6 place civil type.



MOCKUP of LZ-5 depicts two-level cabin, and shows how stretchers would be arranged.

It appears that the military now recognizes the merits of Doman Helicopters' rotary-wing ideas.

The U.S. Army Field Forces plans to buy and service-test this company's new 4-to-6-placer, designated the LZ-5, for which designing now is about 70% complete and components are being manufactured. Doman's present schedule anticipates CAA certification before the end of 1952.

► **The Doman System**—Key feature of the LZ-5, engineering-wise, is the Doman rotor system—a hingeless, four-bladed, oil-lubricated configuration that gives a minimum of vibration in the fuselage and controls. The rotor and its control system have been applied to two prior copters: the LZ-1, which was a Sikorsky R-6 used as a test vehicle; and the LZ-4, a Doman-designed-and-built craft which was purchased by Curtiss-Wright and was being flown for that company by Doman. The new LZ-5, though bearing a general similarity to the -4 represents a new design effort.

► **Plenty of Cabin Space**—Fuselage layout emphasizes maximum open space. This is achieved by disposing the powerplant angularly beneath the cockpit floor, in a cab-over-engine arrangement. Maximums in the cargo compartment are: height, 5 ft. 11 in.; width, 5 ft.; length, 8 ft. 4 in.

Empty weight is 2,860 lb., useful load is 1,559 lb., design gross, 4,419 lb.

High speed at sea level is 90 knots (103.7 mph.), cruise at 55% takeoff power is 75 knots (86 mph.) and at 65% power is 82 knots (94.5 mph.).

The copter will be capable of being stowed in the Fairchild C-119 for ferrying. Service-wise it is slanted for evacuation missions, front-line air observation and reconnaissance, wire-laying, supply and survey operations.

► **Layout, Accommodations**—Fuselage interior is arranged on two levels. Highest is the cockpit floor, under which the engine is located. Pilot has his own access door from the outside. Cockpit transparent panels give visibility angles with normal eye position approximately as follows: straight-ahead vertical plane, 210 deg.; horizontal plane, 320 deg.; and downward sight over floor board, 45 deg.

Main cabin floor is stepped down 18½ in. from cockpit floor, with no partition between the two areas for easy access in flight. The cabin is fitted with a non-structural windowed panel on each side, and quick disconnects allow its removal for loading of bulky objects.

Doors within the panel serve for personnel entrance.

Accommodations will take care of four litters in addition to an attendant and pilot, but this condition will not meet the guaranteed very high rate of climb of 1,300 fpm. This 1,300-fpm performance is for a crew of 2 (400 lb.), 2 patients and litters (250 lb. each), 400 lb. of fuel, 100 lb. of miscellaneous baggage, 100 lb. of fixed military equipment, etc.

The CG shift permissible in the cabin will allow the cargo to be moved about 52½ in. fore or aft of the rotor hub centerline.

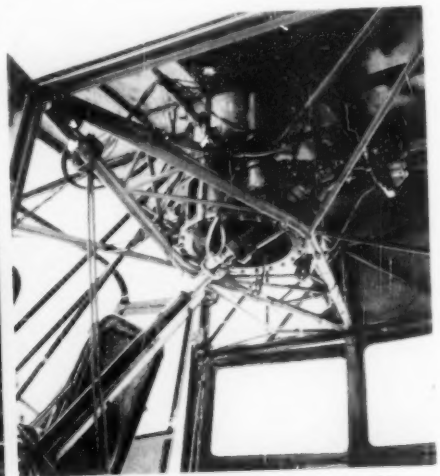
Floor structure is made up as a box beam of dural sheet, and compartments in the box accommodate fuel cells totaling 110 gal., battery, electrical regulators, auxiliary fuel pump, landing gear torque shaft and tunnels for engine ejection cooling ducts. Forward end of the floor beam carries fittings for attachment of engine mount and nose wheel struts.

Central cabin and tail boom struc-

DOMAN LZ-4 was built specifically for use as a military rescue craft. It features . . .

ENGINE set below side-by-side cockpit . . .

BIG CABIN, demonstrated by Glidden S. Doman. Between seats . . .



SHAFT is linked to rotor. Projecting through roof is . . .

ROTOR HEAD, four hingeless blades.

ture is of welded tubular steel.

Fuselage is covered with dural and magnesium sheet fairings.

Attachment of most of this covering is designed so that panels can be removed.

► **Engine Installation**—The engine compartment, located in the lower portion of the fuselage nose, has for its firewall the stainless-steel-faced cockpit floor and the 18¼-in. stepdown wall from cockpit to main cabin. Entire engine cowl is detachable with quick-acting cowl fasteners, and removal of the plant is simple—without the necessity for lifting equipment.

The engine section houses the 400-hp. SO-580D-1 cowling, the oil cooler and oil tank. These latter units are attached to the engine mount so that removal of the engine by removal of the mount leaves these accessories intact.

Engine crankcase centerline is inclined up and aft at 32 deg. to the static ground line. This places accessories at the front end of the aircraft where they are easily accessible.

Cooling air is admitted through a large duct from the helicopter nose and passes around the engine cylinders into two ducts beneath the main cabin section with discharges aft of the floor beam. Energy for this flow is created by ejectors on the engine exhausts. Space is provided for installation of an engine-driven fan to augment ejectors.

► **Rotor Details**—Theory of the Doman rotor and control system was comprehensively analyzed in AVIATION WEEK Jan. 26, 1948, p. 28 and Feb. 2, 1948, p. 21. The dynamically balanced rotor

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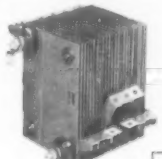

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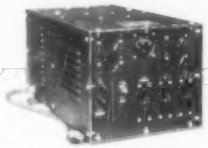
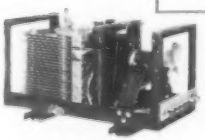
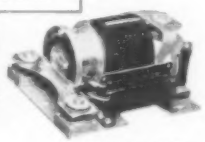


FTR 3414-A5 Ground Aircraft Power Supply



FTR 3146-B5 Aircraft Power Supply



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- Cruising speed at 55% takeoff power ..... 75 knots
- Range at cruising speed with minimum warmup and 10% reserve fuel ..... 260 mi
- Max. endurance with 5 min. warmup and 10% reserve fuel ..... 4 hr.
- Max. possible radius to pickup casualties and return without exceeding normal gross (speed for best range) ..... 285 mi.
- Hovering ceiling with 250 lb. overload representing additional stretcher casualty or 250 lb. additional fuel. Normal is pilot, copilot and 2 litter patients) ..... 7,300 ft.
- Hovering ceiling with 400 lb. overload representing aircraft as 6-place with normal fuel ..... 6,000 ft.
- Max. ferry range with pilot and copilot and tankage provided in aircraft ..... 470 mi.

* Guaranteed.

system was developed during a six-year flight research program and features long life, operating smoothness and reliability. It probably is the only four-bladed rotor now available in the U.S.

Tests conducted with the rotor are reported to have demonstrated low blade stresses, low vibration levels, hands-off stability in forward flight, control stick force gradients proportional to severity of maneuver, and ability to engage rotor in high winds.

Rotor head and gearbox are combined in an integral unit, with part of the reduction gearing mounted above the rotor hub. This allows a constant-velocity universal joint, which is inherent to this rotor system, to rotate at higher speeds than at which the rotor is actually turning, hence permitting a smaller joint because loads will be lower at the higher speed. Lubrication of all moving parts is by oil.

► **Blade Makeup**—Basic blade structure consists of a leading edge beam or support of phenolic resin-bonded laminated birch extending to the 35% chord. From the leading edge support to the trailing edge the blade consists of a four-ply mahogany covering attached to a white cedar trailing edge gluing strip and spruce ribs.

Set in the entire trailing edge and on the line of symmetry of the airfoil is a dural strip $\frac{7}{8} \times .020$ in. in cross-section. This strip is bonded to the

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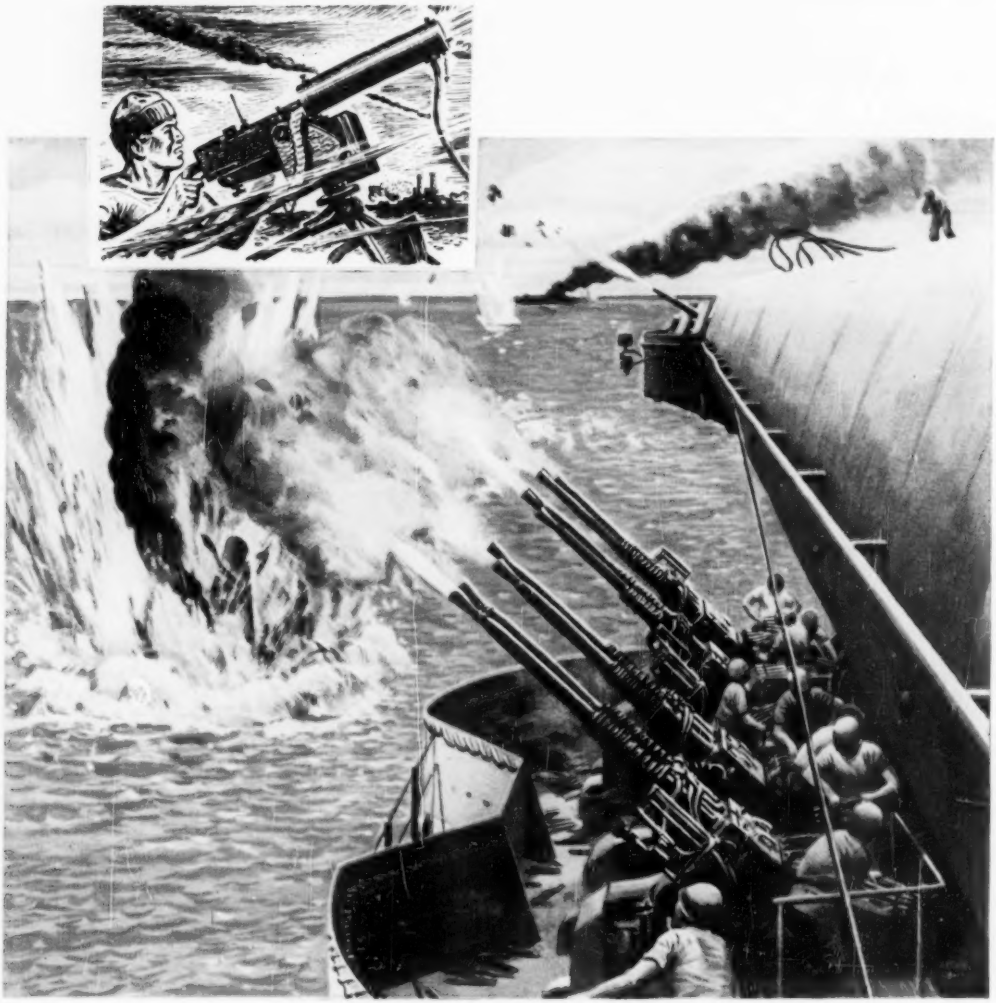

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QUALITY ARMA PRECISION
INSTRUMENT

Main Rotor

- Diameter ..... 48 ft.
- Disk area ..... 1,810 sq. ft.
- Blade area (each) ..... 18.4 sq. ft.
- Blade area (total) ..... 73.6 sq. ft.
- Number of blades 4
- Blade chord at tip ..... 7 in.
- Blade chord at root ..... 17.1 in.
- Solidity ratio ..... .0407
- Blade pitch range collective +.3 to 15 deg.
  Superimposed cyclic ..±9 deg.
- Rotor rpm. (cruising at 3,000 engine rpm.) 181
- Takeoff power loading 11.05 lb./hp.
- Rotor disk loading 2.44 lb./sq. ft.
- Gear ratio, engine to main rotor 16.55:1
- Tip speed (takeoff) ..... 502 fps.
- Airfoil ..... .0012
- Height above ground line 10 ft. 3 in.

Tail Rotor

- Diameter ..... 9 ft.
- Number of blades 3
- Disk area ..... 63.6 sq. ft.
- Blade area (each) ..... 2.15 sq. ft.
- Blade area (total) ..... 6.45 sq. ft.
- Chord (max.) ..... 8.52 in.
  (min.) ..... 4.6 in.
- Gear ratio, engine to tail rotor 2.09:1
- Incidence angles −5 to + 17 deg.
- Airfoil ..... .0012
- Clearance to ground line (static) ..... 6 ft. 8 in.
- Horizontal stabilizer area (subject to change as a result of flight tests) ..... 7.0 sq. ft.
- Landing gear
  Type ..... Quadricycle
  Tread ..... 7 ft. 2 in
  Wheel base ..... 6 ft. 9 in.

blade and protrudes ¼ in. beyond the mahogany covering and forms the extreme trailing edge.

It is adjustable in order to give aerodynamic symmetry of all sections of the blade.

Leading edge is protected against abrasion by a stainless steel strip 2 in. wide by .010 in. thick.

A tubular steel spar is fitted to the blade inboard end, extends into the birch spar and passes through a phenolic tube bonded to the latter during its fabrication.

In this area the birch spar is reinforced by dural cover plates and bolts, and at the outer end of the steel spar there is a cavity through which a locking ring and key may be withdrawn for blade removal.

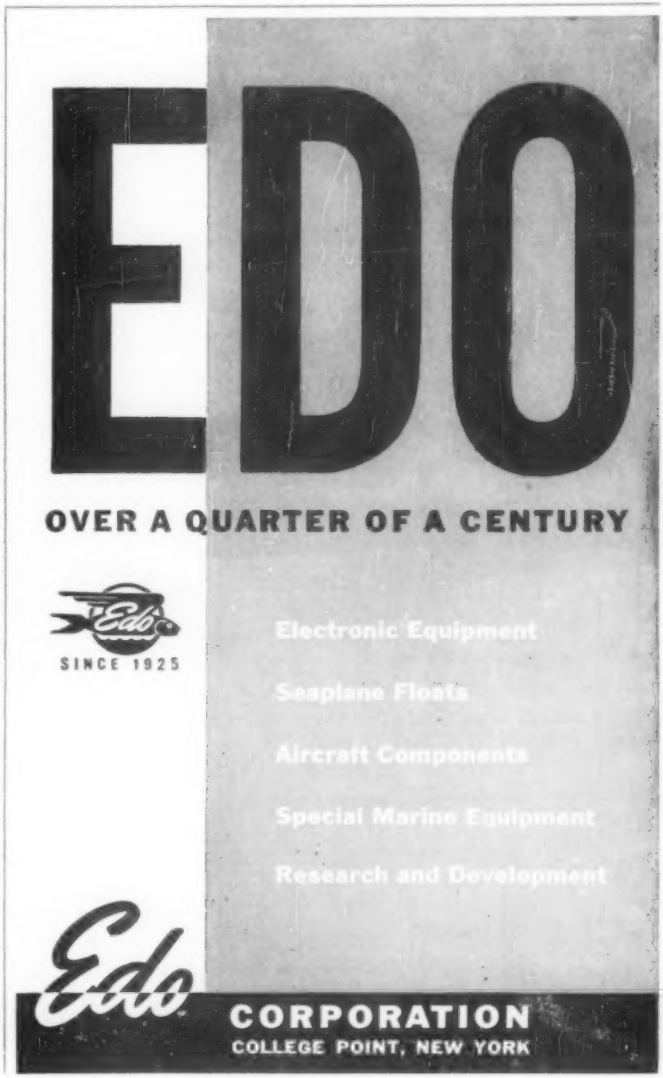
To facilitate servicing and minimize extent of teardown, all driving parts, including gears and universal joint, are quickly removable from the top and/or bottom of the rotor head assembly without removing or disturbing any portion of the control system and without removing rotor blades or hub.

If some part of the rotor head controls are to be removed, the main rotor hub blades and upper transmission assembly may be readily hoisted without disturbing the upper transmission. After this, the entire main rotor control assembly can be easily raised and removed from the pylon tube for bench operations.

► **Fluid Coupling**—A unique feature of of the copter is the fluid coupling mounted directly to the engine crankshaft flange, to produce initial rotation of the rotor. Built integrally with this coupling is a centrifugally operated lockup device whose pawls seek reengagement at about 1,400 rpm. of the shaft. Thereafter, engagement is accomplished by momentary release of engine torque through throttle manipulation.

Disengagement of the device in autorotation is precluded by an automatic dog-catch on the throttle linkage, which prevents throttle closing below 1,400 rpm.

Closing of the throttle below this point is possible by manual tripping of the dog-catch.



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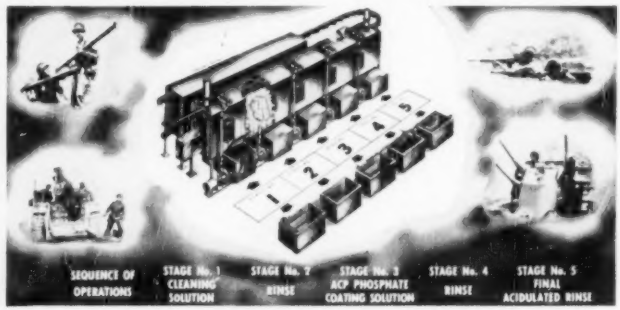
Technical Service Data Sheet
Subject: METAL PRESERVATION AND PAINT PROTECTION WITH ACP PHOSPHATE COATING CHEMICALS


SEQUENCE OF OPERATIONS
STAGE No. 1 CLEANING SOLUTION
STAGE No. 2 RINSE
STAGE No. 3 ACP PHOSPHATE COATING SOLUTION
STAGE No. 4 RINSE
STAGE No. 5 FINAL ACIDULATED RINSE

U.S. ARMY PHOTOGRAPHS COURTESY OF "ORDNANCE MAGAZINE"

Typical spray and dip phosphating equipment and some ordnance products that are now given a protective phosphate coating for extra durability under all kinds of severe exposure conditions. Both military and civilian applications of ACP phosphate coating chemicals are shown in the chart below.

SELECTION CHART OF ACP PROTECTIVE COATING CHEMICALS FOR STEEL, ZINC, AND ALUMINUM

METAL	ACP CHEMICAL	OBJECT OF COATING	TYPICAL METAL PRODUCTS TREATED	GOVERNMENT SPECIFICATIONS
STEEL	"GRANODINE" Zinc Phosphate Coating Chemical	Improved paint adhesion	Steel, iron, or zinc fabricated units or components, automobile bodies, refrigerators, washing machines, cabinets, etc., projectiles, rockets, bombs, rifles, small arms, belt links, cartridge cases, vehicular sheet metal, tank bolts and links, recoilless guns, etc.	MIL-S-5002 JAN-C-490, Grade 1 JAN-F-495 U.S.A. 57-0-2, Type II, Class C U.S.A. 51-70-1, Finish 22.02, Class C U.S.A. 50-60-1 16 E4 (Ships)
	"PERMADINE" Zinc Phosphate Coating Chemical	Rust and corrosion prevention	Nuts, bolts, screws, hardware items, tools, guns, cartridge clips, fire control instruments, metallic belt links, steel aircraft parts, certain steel projectiles and many other components.	MIL-C-16232 U.S.A. 57-0-2, Type II, Class B U.S.A. 51-70-1, Finish 22.02, Class B Navy Aeronautical M-364 U.S.A. 72-53 (See AN-F-20)
	"THERMOIL-GRANODINE" Manganese-iron Phosphate Coating	Wear-resistance anti-galling, safe break-in of friction or rubbing parts. Rust proofing.	Friction surfaces such as pistons, piston rings, gears, cylinder liners, camshafts, tappets, crankshafts, rocker arms, etc. Small arms, weapon components. Hardware items, etc.	MIL-C-16232 U.S.A. 57-0-2, Type II, Class A U.S.A. 51-70-1, Finish 22.02 Class A Navy Aeronautical M-364 U.S.A. 72-53 (See AN-F-20)
	"GRANODRAW" Zinc-iron Phosphate Coating	Improved drawing, extrusion, and cold forming	Blanks and shells for cold forming, heavy stampings, tubs, tubing for forming or drawing, wire, rod, etc.	———
ALUMINUM	"ALODINE" Protective Coating	Improved paint adhesion and corrosion resistance	Aluminum products of similar design such as refrigerator parts, wall tile, signs, washing machine tubs, etc., aircraft and aircraft parts, bazookas (rocket launchers), helmets, belt buckles, clothes dryers, clothesline, rocket motors, etc., aluminum strip or sheet stock.	MIL-C-5541 (See also QPL-5541-1) MIL-S-5002 AN-F-20 U.S. Navord O.S. 675 16 E4 (Ships) AN-C-170 (See MIL-C-5541) U.S.A. 72-53 (See AN-F-20)
ZINC	"LITHOFORM" Zinc Phosphate Coating Chemical	Improved paint adhesion	Zinc alloy die castings, zinc or cadmium plated sheet or components, hot dip galvanized stock, galvanneal, siding, roofing, galvanized truck bodies, etc.	QQ-P-416 RR-C-83 JAN-F-495 AN-F-20 U.S.N. Appendix 6 U.S.A. 72-53 (See AN-F-20)

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CHEMICALS ACP PROCESSES

NACA Reports

(NACA Technical Notes are informal papers printed in limited quantities for domestic use only. They are obtainable free of charge, only by persons having a professional interest in them. Write to Division of Research Information, NACA, 1724 F St., N. W., Washington 25, D. C.)

► Application of X-Ray Absorption to Measurement of Small Air-Density Gradients (TN 2406)—By Ruth N. Weltmann, Steven Fairweather and Daryl Papke.

Determining air densities by X-ray rather than by optical methods shows two advantages. First, over a long path length, X-ray refraction errors are reduced by a factor of at least 1,000 compared to optical errors. And second, no probes have to be inserted into the airstream in a windtunnel.

But these radiation methods can only be used when the flow is two-dimensional.

This note presents two methods which are refinements of a previous single application. One of these methods uses a Geiger-Mueller counter to detect X-ray absorption; the other method is photographic, and uses film. The first method was successfully applied, but the second presented a problem in beam divergence which has not been completely solved. However a solution is proposed by the authors.

► Axial-Momentum Theory for Propellers in Compressible Flow (TN 2164)— By Arthur W. Vogeley.

This note, issued in July 1951 is a corrected version to supersede the August, 1950 note.

The author is concerned with developing a simple theory for the propeller in compressible flow. The use of an axial-momentum concept predicts flow conditions through a prop that are considerably different from those predicted by incompressible-flow theory. But the theory neglects rotation and profile drag.

It is suggested in the note that parameters such as rotation, profile drag and number of blades be investigated, because the effects expected from simple considerations could be either amplified or counteracted by these parameters.

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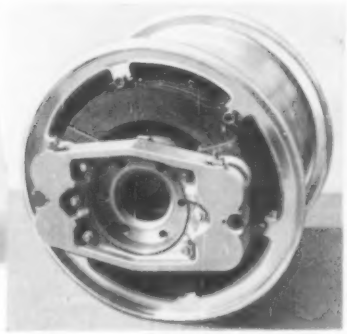

22.5"
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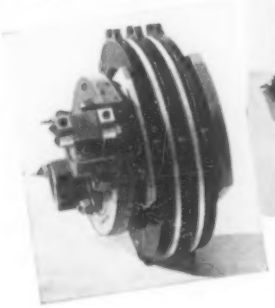
105 10⁶ FT. LB.



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The equipment will be adequately stressed for both static and dynamic loads.

This is the information we need:—

1) Brief description of the aircraft, with sketch showing centre of gravity and wheel positions
2) Type of landing gear desired
3) Take off and landing weights
4) Take off and landing speeds
5) Tire pressure—rim and valve design
6) Official requirements

SEND YOUR ENQUIRIES TO: **MESSIER**, 6, AVENUE RAYMOND POINCARE — PARIS (FRANCE)

Ideas you can use!

These diagrams show a few of the ways in which Sylphon bellows assemblies are used—where there's a design problem involving control of temperatures or pressures. They open and close valves, dampers, etc., absorb expansion, provide packless construction, have many more uses.

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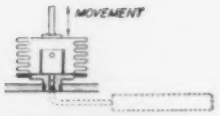

Fig. 1 Thermostatic Motor—This type of assembly is widely used in temperature regulators, etc., where a thermostatic charge is confined in the bellows and where a valve, switch, damper, etc. is to be operated in response to temperature changes.

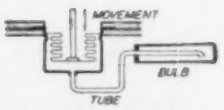

Fig. 2 Thermostatic Motor—This assembly is used where it is desirable to have the thermostatic charge confined outside the bellows and within a cup. May be used with or without remote bulb shown.

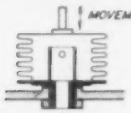

Fig. 3 Pressure Motor—Bellows assemblies are often employed to convert pressure effects into controlled movement. Fig. 3 shows such an assembly where the pressure is applied inside the bellows.

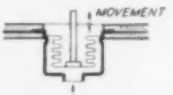

Fig. 4 Pressure Motor—This assembly differs from Fig. 3 in that the pressure is applied outside the bellows and within a cup.

Fig. 5 Expansion Chamber—This type of assembly is employed to absorb thermal or pressure expansion. With suitable heads, it would be used to serve as a reservoir for a liquid or gas. Example: Oil reservoir for electrical cable joint.

Fig. 6 Expansion Joint—Packless and leakless construction for expansion joints used to absorb thermal expansion of pipe lines carrying steam, water, etc. May be used to absorb vibration and provide flexible connection for other applications.

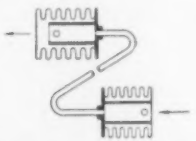

Fig. 7 Motion Transmission—Two bellows assemblies joined by a tube for hydraulic transmission of motion or power. Motive force applied may be either thermostatic or mechanical.

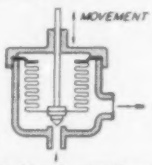

Fig. 8 Packless Construction—Illustrating packless valve construction. Same principle used to seal stem movement or adjustment in many types of apparatus.

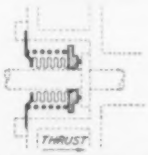

Fig. 9 Shaft Seal—Widely used for refrigeration compressors to prevent leakage around revolving shaft. Spring pressure holds nose of seal against shoulder on shaft. Another type used rotates with shaft and seals against stationary plate.

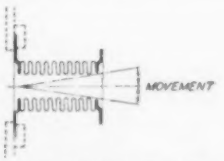

Fig. 10 Flexible Joint—Providing a means to seal a flexible joint or mechanical movement of levers, linkage, etc., against leakage where the movement must be conveyed outside an enclosure. Example: Operating stem of float switches, etc.

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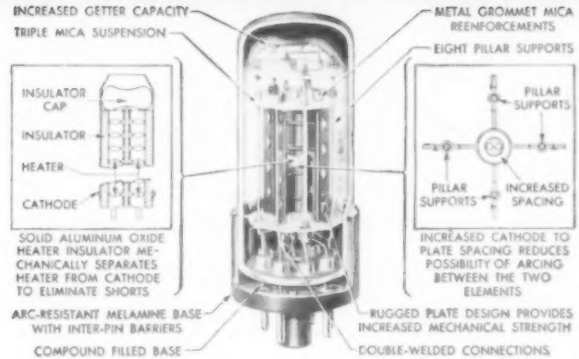
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We are not in the standard vacuum tube business, but we are in the business of developing and manufacturing a reliable line of special purpose electron tubes—tubes that will serve and meet the stiff and varied operational requirements of aviation, ordnance, marine and other fields of modern industry. Typical of these are receiving type tubes such as Beam-Power Amplifiers, R-F Pentodes, Twin Triodes, and the Full-Wave Rectifiers illustrated above and described below. All of these tubes are exhausted on a special automatic exhausting machine capable of extra high evacuation, and are aged under full operating and vibration conditions for a period of 50 hours. In addition to the tubes described above, Eclipse-Pioneer also manufactures special purpose tubes in the following categories: gas-filled control tubes, Klystron tubes, spark gaps, temperature tubes and voltage regulator tubes.

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Electrical Characteristics of E-P Full-Wave Rectifier Tubes

TUBE TYPE	R.M.A. 5838	R.M.A. 5839	R.M.A. 5852	R.M.A. 5993
Heater Voltage	12 volts	26.5 volts	6.3 volts	6.3 volts
Heater Current	0.6 amps.	0.285 amps.	1.2 amps.	0.80 amps.
Peak Inverse Voltage	1375 v. (max.)	1375 v. (max.)	1375 v. (max.)	1250 v. (max.)
Peak Plate Current (per plate)	270 ma. (max.)	270 ma. (max.)	270 ma. (max.)	230 ma. (max.)
D-C Heater-Cathode Potential	450 v. (max.)	450 v. (max.)	450 v. (max.)	400 v. (max.)
Cathode Heating Time	1 min.	1 min.	1 min.	45 sec.
Total Effective Plate Supply Impedance	150 ohms (min.)	150 ohms (min.)	150 ohms (min.)	150 ohms (min.)

Other E-P precision components for servo mechanism and computing equipment:

Synchros • Servo motors and systems • rate generators • gyros • stabilization equipment • turbine power supplies and remote indicating-transmitting systems.

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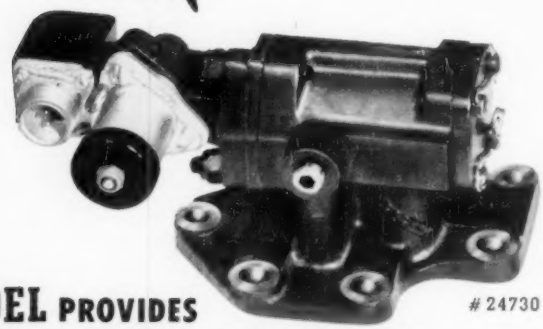

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menting with ceramic-coated titanium to determine whether this approach can be as successful as use of coated stainless steel to prevent oxidation at very high temperatures.

Lecturer Describes Flow Mixture Data

Details of a theory explaining a complicated phase of aerodynamics were outlined recently before a New York Section meeting of the Institute of the Aeronautical Sciences. Lecturer was Dr. Luigi Crocco, Goddard Professor of Jet Propulsion at Princeton University, who developed the theory jointly with the university's Professor Lester Lees.

Dr. Crocco described a new approach to the problem of interaction between boundary layer and external flows based on the fundamental conception that the governing process is the mixing between the two flows.

He expounded the theory using very basic laws, such as the conservation of energy, momentum, etc. It was shown that the parameter of mixing length was an important factor. By means of the Stewartson Transformation, he was able to reduce the compressible boundary layer flow case to the incompressible flow case, thus making available considerable boundary layer data.

Dr. Crocco believes that by a similar transformation the results can be extended to the turbulent case.

His method was semi-theoretical in that experimental values had to be obtained for various parameters, particularly the mixing length. The qualitative agreement for the laminar compressible boundary layer case between theory and experiment is very encouraging. Some applications of this theory to the case of base pressure and boundary layer shock interaction have already been made, and good qualitative comparisons were obtained.

Dr. Crocco's theory can be applied to determine the optimum supersonic fuselage shape and with a slight extension to the case where the jet flow exists at the tail of the fuselage.

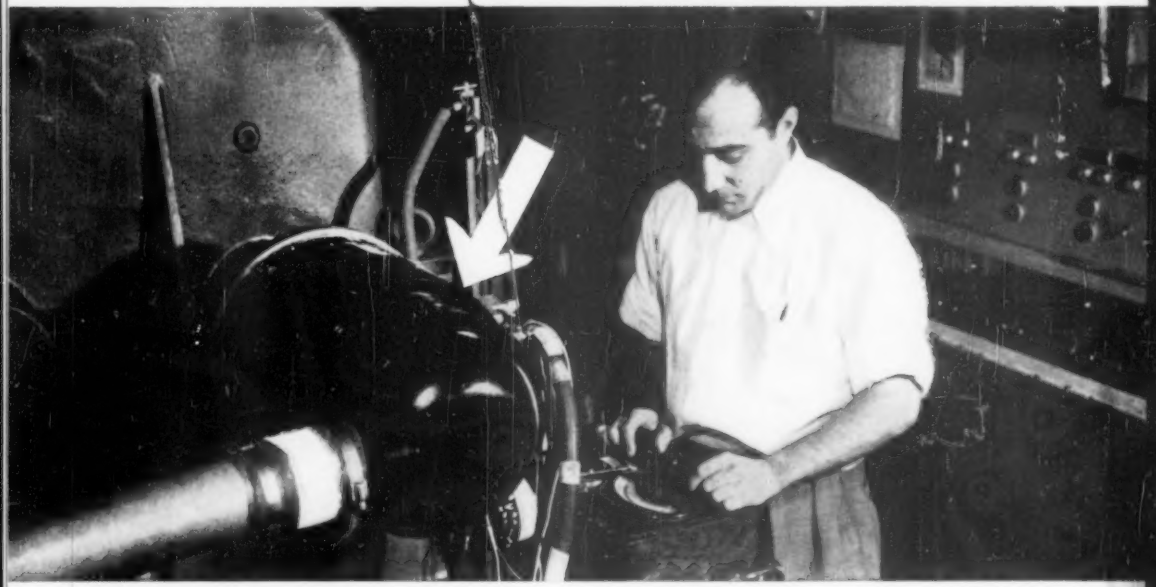
New UHF Capacitor

Sprague Electric Co., North Adams, Mass. announces a new "shirt-stud" capacitor for coupling UHF circuits. It's only ¼ in. diameter, and is of ceramic material. Manufacturer's designation is Type 502C.

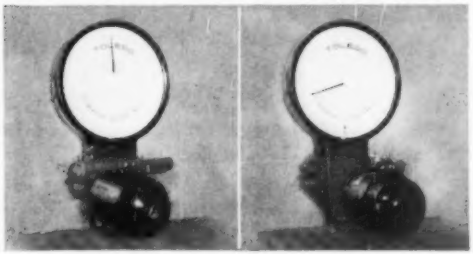
Capacitance values range up to 22 mmf. at 500 v. dc. The units are fitted with hollow connections to take either leads or pins from subminiature electron tubes.

Information can be obtained by writing on company letterhead for Sprague Engineering Bulletin 605.

LIGHTER, MORE RELIABLE ELECTRIC SYSTEMS WITH
New G-E Alternators

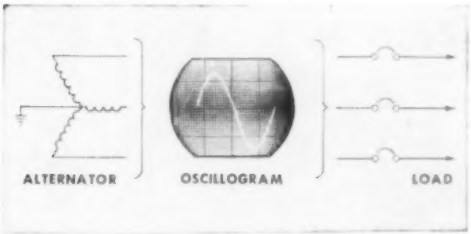


Rugged tests of new a-c generators (arrow) under worse than actual conditions establish their dependability in service. An outstanding feature of these alternators is their 300% short circuit current rating. This provides a safety margin to insure operation of the line clearing devices and gives positive short circuit protection.



30-KW D-C GENERATOR | 30-KVA ALTERNATOR

Weight is down 30% with the new alternator, over an equivalent d-c generator. Exciter and slip ring brush wear is negligible at the low exciter currents in a-c machines. Sparking and brush wear of d-c generators under conditions of high altitudes and high power output are eliminated.



Nearly perfect sine wave output of the alternators allows proper operation of electronic equipment demanding a low percentage of harmonics in the voltage wave form.

300% Short Circuit Current Rating is Feature of New Line

Savings in weight and space plus greater reliability are natural advantages of alternating current in aircraft electric systems. General Electric offers these benefits in a new line of 3-phase, a-c generators to satisfy nearly every combination of engines, airframes, and loads.

Available either wye- or delta connected in a variety of ratings and speed ranges these alternators meet military specifications MIL-G-6099. Already a large number are on order by airframe manufacturers in addition to quantities being furnished the military services for both fighters and heavier aircraft.

Whether your problem is a-c or d-c, a single instrument or complete electrical systems for a fleet, contact your General Electric aviation specialist, or write General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

Details of Australia's First Jet Plane

- **Craft designed for use as highspeed target plane.**
- **Pilotless radio-control and piloted versions made.**

(*McGraw-Hill World News*)

Melbourne—First details of Australia's radio-controlled jet-propelled target aircraft have been released here exclusively to AVIATION WEEK. Currently flying in both piloted and pilotless versions, the little craft is this country's first home-grown jet. It was designed and developed by the Government Aircraft Factories of the Australian Department of Defense Production at Melbourne.

Original specification was written by the British Ministry of Supply and covered the requirements for a highspeed, radio-controlled target plane.

▶ **With Pilot**—The piloted variant of the basic design (AVIATION WEEK Dec. 4, 1950, p. 31) is now in the midst of its flight-test program in South Australia. Basic purpose of the tests is to check the radio-control gear and the effectiveness of the ground-to-air control link.

Wingspan of the plane is under 20 ft., and fuselage length is about 22 ft. Wings are detachable, and of constant chord and thickness.

Powerplant of the little ship is the Armstrong Siddeley Adder I turbojet, specifically designed and manufactured for this project. It has a ten-stage axial compressor, six combustion chambers and a two-stage turbine. Outside diameter of the unit is 27 in.

Cooling of the close-fitting fuselage is done by using the jet exhaust as an ejector.

▶ **Without Pilot**—Basically the pilotless version is the same as the piloted. A single prototype has been built and is being flown at the guided missile range at Woomera, South Australia.

It is about the same gross weight as the piloted job, and the geometry is nearly identical. Three important differences distinguish the pilotless version from the piloted model:

- **No cockpit or canopy.** Space allotted to the pilot is filled with radio.
- **Single central skid landing gear.** This has been designed overstrength to cope with the severe landings expected during the initial phases of flight test. As one by-product of flight tests, it is hoped that a good technique will be developed for radio-controlled landings.

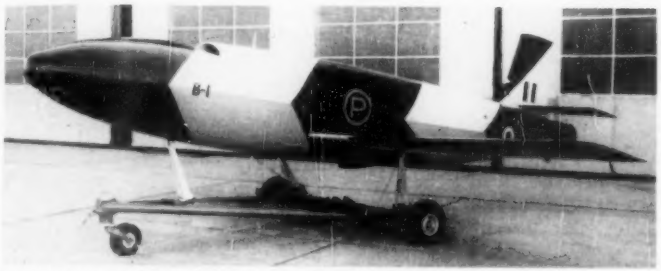
The skid is provided with a high-efficiency shock absorber system capable of dealing with landing velocities which would be beyond the capacity of a normal undercarriage.

- **Flush air intake.** The piloted version has twin external scoops on the fuselage sides, but this one has a single intake on the upper forward surface of the fuselage.

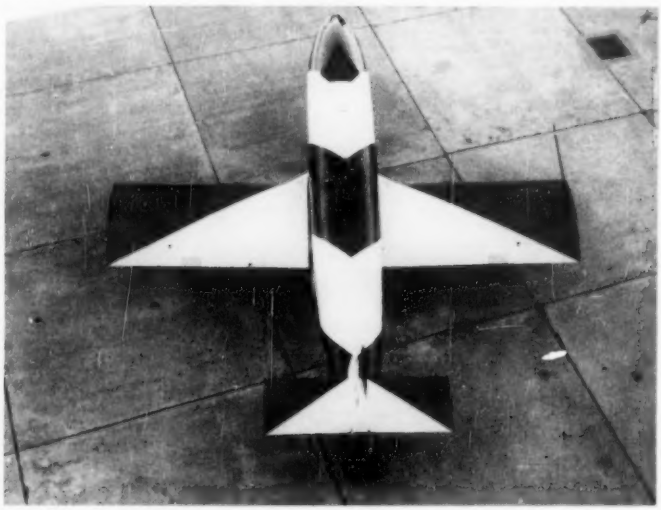
Another minor difference: Vertical tail is tapered, where the original piloted plane had a constant-chord surface.

One special design feature is the tricycle trolley which acts as undercarriage during the takeoff run. It is jettisoned at the instant of takeoff and brakes are applied automatically so that the trolley stops in a reasonable distance.

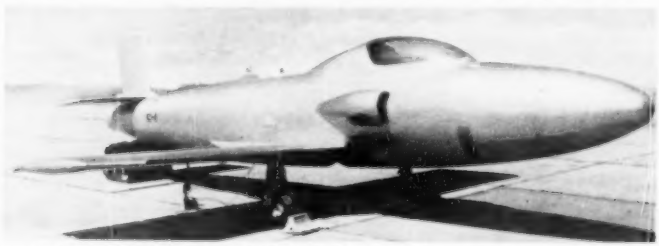
The necessary ground control equipment is housed in a mobile vehicle which also was developed at the Government Aircraft Factories.



PILOTLESS TARGET DRONE takes off on jettisonable trolley, lands on central skid.

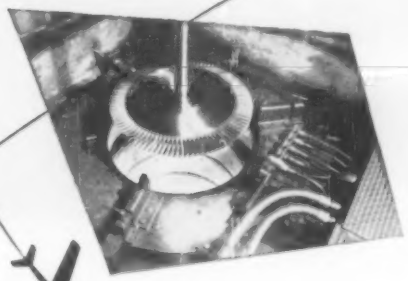


JET PROPULSION is supplied by Armstrong Siddeley Adder I. Wings are detachable.



PILOTED MODEL is undergoing flight tests to check out ground-to-air control link.

DOGFIGHTS IN THE STRATOSPHERE



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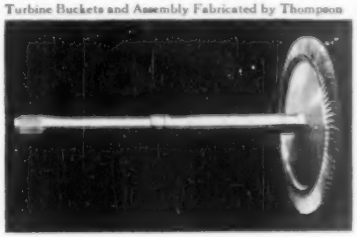

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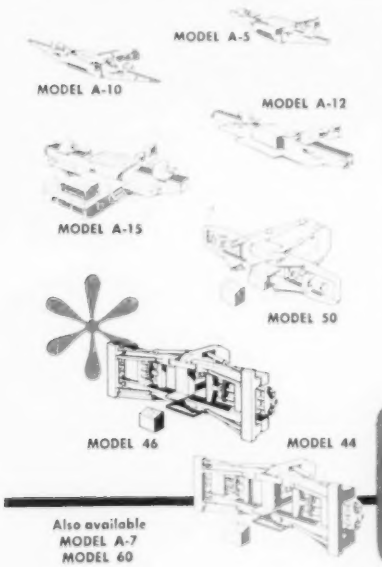
Workhorse of the Aircraft Industry!

BRIEF SPECIFICATIONS
Model 46

Max. Tension cyl. pull @ 2000 psi	318,080 lbs.
Min. Tension cyl. pull	31,808 lbs.
Max. Tension cyl. Stroke	30"
Max. length of part (Ten. cyls. retracted)	194"
Min. length of part	32"
Max. width of part	66"
Max. die length 180° bend—full tonnage	76"
Min. die length 180°—any tonnage	40"
Arm motion	Independent

Photo Courtesy of Boeing Airplane Co., Wichita



Here's the machine that is finding exceptional favor in *all* modern aircraft plants! It's preferred for many reasons, including the following:

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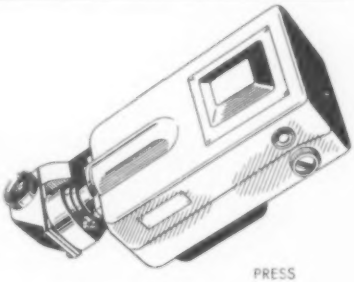
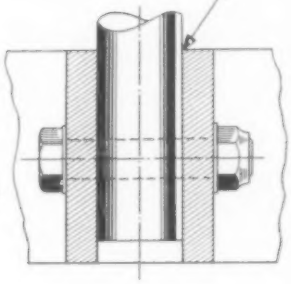
(Advertisement)

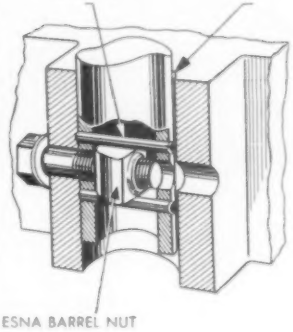
Fastener Problem of the Month

REMOVABLE MOUNTS — JANUARY, 1952

PROBLEM: The installation method used to mount a camera in one of our military planes required an efficient means of fastening a vertical tube securely in a socket. The tube had to be held firmly to prevent camera "wobble" yet easy removal and re-installation were critical factors. The preliminary design called out a press fit for the tube and socket members; the two pieces were positioned with a through bolt. Experience proved this method resulted in slow assembly and the field servicing operation was difficult.







SOLUTION: Two standard Elastic Stop Nut Corporation products—the barrel nut and the Rollpin, provided a ready solution. The ESNA barrel nut Type 1452 slips into the tube and eliminates the need for a tight fit because a bolt through this nut takes out the "wobble" by holding the tube tight against one side of the socket; the Red Elastic locking collar protects the assembly against loosening due to vibration. A single Rollpin is inserted on each end of the barrel nut, holding it in position for easy bolt installation. The Rollpins require only standard drilled holes and are self-retained until deliberately removed with a drift pin or punch.

Would you like to look over ESNA's standard line of fasteners? Just sign your name below and mail this form to us. If you have a special problem, send blueprints or a sketch to:

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2330 VAUXHALL ROAD, UNION, NEW JERSEY.

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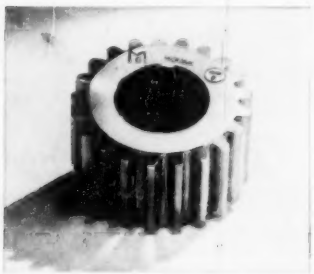

This planet pinion has .0003 MICROWN* —IGW's new after-grinding, high precision crowning process.

*Patent Pending

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EASY INSTALLATION is assured by using dummy phenolic plug during plane fabrication. To put transducer in, flush dummy is removed and wiring attached to pick-up.

Tiny Pick-Up Aids Convair Study

By Bill Chana*

A new subminiature pressure transducer has helped advance highspeed hydrodynamic research at Consolidated Vultee Aircraft Corp.

One of Convair's problems was to measure, very accurately, hull bottom water pressures during takeoff and landing transitions in connection with projects being developed for the Navy's Bureau of Aeronautics.

After obtaining these data from both existing and futuristic hydrodynamic hull bottom shapes, Convair engineering technical groups could develop parameters useful for efficient structural and hydrodynamic design.

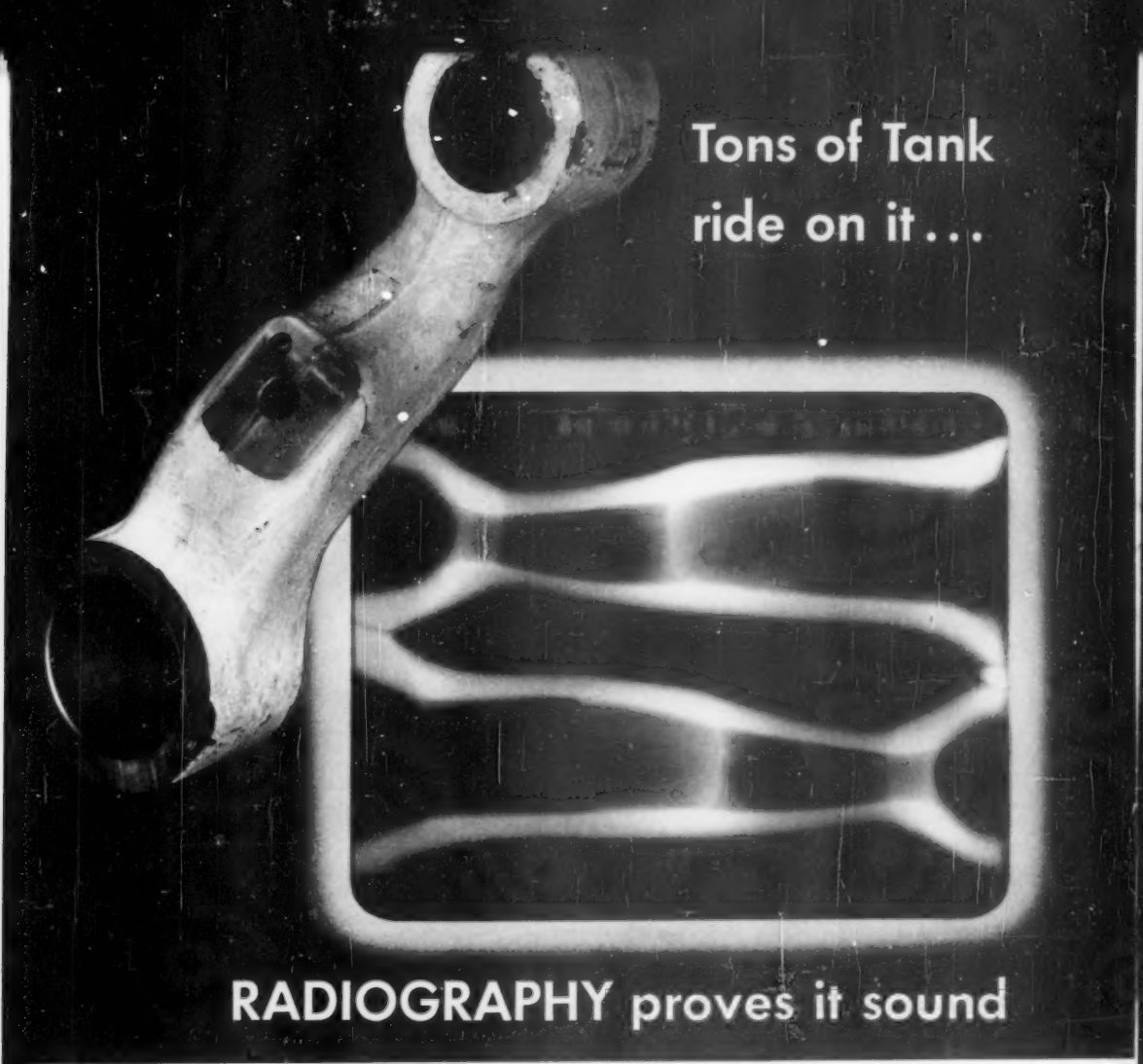
▶ **Something New**—It became obvious that something entirely new in the way of pressure pickups would be required. With small one-or-two-place highspeed tactical water-based aircraft projects being considered, it was first thought that it would be necessary to install the pressure pickups during the construction period, but there are many blind and inaccessible working areas in small compact aircraft.

Since the real value of hydrodynamic research is proven during open-sea rough-water tests, and because these trials are usually conducted many months after initial flights of full-scale aircraft, it was impractical to follow older methods.

A pressure transducer had to be designed which could virtually be plugged into the side of the hull at the time of the test.

Several manufacturers were advised of the requirements and invited to sub-

* Flight test engineer, Consolidated Vultee Aircraft Corp., San Diego.



It's the arm that carries the rear caterpillar track wheel of a tank. Failure would mean complete disablement—so soundness in the casting is a "must."

To make sure, the casting is radiographed. It's the one way to learn internal conditions without destroying the part.

Cases like this show why radiography is becoming routine in foundries everywhere. It helps earn a reputation for constant top-quality work—frequently suggests changes in operations that bring higher yields in production runs.

Your x-ray dealer will be glad to discuss ways radiography can increase your production. Get in touch with him. Also send for a free copy of "Radiography As A Foundry Tool."

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Radiography...

another important function of photography

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Pressure Transducer Specifications

Range, psia.	Nominal Input, ohms	Resistance Output, ohms	Max. Input, Volts	Full Scale Open Circuit Output, mv.	Approx. Natural Freq., cps.	Total Allowable Press., psia.	G Effect, %/G
10	415	325	11	15	700	20	5
30	415	325	11	15	1,200	60	
100	415	325	11	15	2,200	200	1

unit designs for a suitable transducer.

The relatively high pressures and high frequency of the water flow at high speeds meant that the methods of recording pressures either by manometer or other common end instruments connected by tubing to the pressure source were impractical. Even short lengths of pressure lines to transducers near the source were considered inefficient in the majority of applications.

The pressure transducer had to be right at the source—a pressure diaphragm flush with the hull bottom surface.

► **Installation Provisions**—Convair engineers decided that the flush diaphragm would have to be only ¼ in. in diameter so that a hole no larger than this would be required in the skin surface. To get into thin wings and cramped quarters within the hull, a limit depth of 1¼ in. was set up as a requirement. First, a structural capsule container would be riveted to the skin, separated only by a thin gasket of chromate tape for sealing and maximum protection against salt water corrosion. A dummy phenolic plug would be installed in the container until the time came to install the actual pressure transducer.

The electrical cable routing which would be installed during fabrication of the airframe would be attached to the dummy capsule so that when it became necessary to install the transducer, the wiring would be pulled outside of the hull for hookup.

The wiring would then be transferred to the transducer and the unit would be plugged into the container in the hull. Two small retainer rings installed with a four-prong spanner wrench would secure it. A special calibrating adapter could be secured to the hull bottom covering the flush diaphragm of the transducer so that installation and spotcheck calibrations could be made.

► **Specs**—Convair electronic engineers specified that, in addition to these physical requirements, the small transducer should be capable of producing sufficient output to drive oscillographic galvanometers (in order to save weight), without carrier amplifiers.

Statham Laboratories, Inc., Los Angeles, developed a simple and efficient unbonded strain gage pick-up, a small unit called a Subminiature Pressure Transducer, Model PSL. This unit seems to meet all of the requirements.

It is available in three ranges—10, 30, and 100 psi, absolute and is temperature-compensated for a maximum error of 0.01% of full scale per degree F, from −50F to +100F. The detail specifications, as indicated in the accompanying tabulation, show the close tolerances set by Statham to provide the accuracy required for hydrodynamic research at Convair.

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Even 20-20 vision could hardly see the dimly lit face of old radar screens! The time lost as the pilot's eyes adjusted themselves from a glaring haze-blanketed sky to a low-illumination radar screen was too long. In aerial combat life or death depend on instant recognition and reaction.

Philco scientists saw the need for better illuminated radar screens . . . and today, thanks to their research and development, newest radar tubes give forty times more light output than before for easy and unhampered reading.

To accomplish this, Philco engineers and scientists found it necessary to develop new techniques . . . even new materials . . . and then new production processes to make the results of their research commercially practical.

Philco is justly proud of this significant contribution to military and industrial electronics. It is another example of the outstanding results achieved by Philco's staff of engineers and scientists in turning scientific research and theory into practical application.

PHILCO CORPORATION

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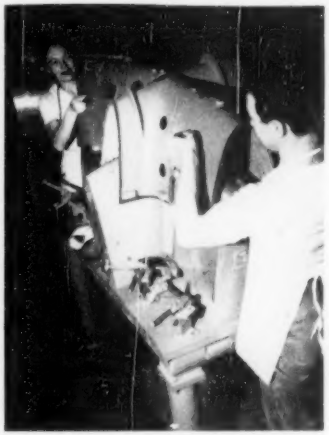
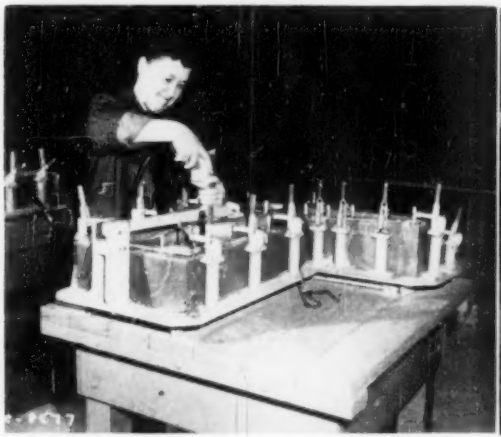
LOCKHEED technician installs gripper beads on plastic double-action die, while . . .



WORKERS mount plastic drill guide.



DRILLER uses plastic contour jig on metal part. Typical . . . JIGS are made of Rezolin plastic (top) and Fiberglas (bottom).

Plastic Tooling Cuts Costs at Lockheed

Dies of non-critical phenolic resin base save time by eliminating need for grinding and polishing.

Plastic tooling is paying big dividends in the aircraft industry—with savings in manhours, money and material.

One of the major airframe builders using plastics instead of scarce-supply traditional die material is Lockheed Aircraft Corp. In its production scheme, it makes 50-60% of its forming tools from plastics. Aluminum alloy parts going into its commercial and military planes are being formed, trimmed and drilled with a whole family of new-type plastic tools.

Plastic tooling at Lockheed ceased to be an experiment about three years ago, after continuous research since 1942. Now the making of plastic dies and tools is a well-established and expanding operation, keeping 88 men busy in a $175,000 plastics tool shop, the company reports.

G. J. Walkey, manufacturing and research engineer who has supervised the majority of Lockheed's plastic research and production, believes that the potential of plastics is only limited by the engineer's imagination. "New type plastics with improved physical characteristics," he says, "are continually coming on the market. This naturally opens up new fields for further development of a program we believe has boundless possibilities."

► **Benefits From Plastics**—The company is enthusiastic about plastic tooling for aircraft because it affords:

- Shorter die-making time, with re-

CONNIE transport barrel section formed on plastic die comes off stretch press, and . . .

AIR DUCT panel is inspected.

sultant economies in manhours.

- Economies with scarce die metal.
- Quick and economical repair of tools.
- Easier handling of tools because of lighter weight.
- Aircraft parts of increased size, thus simplifying assembly, saving weight and speeding output.

Quantity requirements are usually low for any individual part, because of frequent design changes. Tools quickly become obsolete. Consequently, tool costs must be held to a minimum, causing a continuous search for a means to attain this result. Plastic materials are one solution.

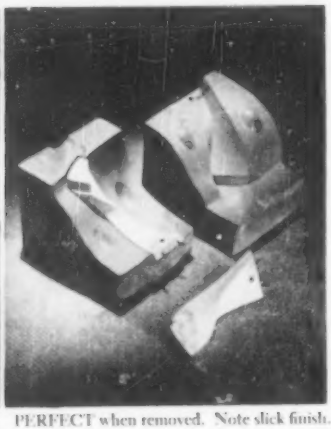
A typical example of the advantages afforded by plastic tooling is that the inner structure of the 12 by 2 ft. landing gear door on the P2V patrol bomber was formerly made up of 42 parts, but now is made in one piece on a plastic double action die.

Stretch press dies as large as 15 by 4 ft. have been made of plastic and can be easily handled at their weight of 3,500 lb. Weight of a similar die constructed of Kirksite would have made handling prohibitive because it would gross 35,000 lb.

▶ **Procedure, Savings**—Plastic tooling is divided into three groups: Forming—double-action and stretch dies; trimming—router and shaper blocks; drilling—overpress templates and portable and stationary drill jigs.

Plastic dies are constructed by first using a plaster splash technique from a master. The splash mold is placed in an inverted die box, then is filled with a phenolic plastic poured through holes in the bottom of the box. The plastic is cured by letting the mold set overnight or by heating in an oven, generally about 8 hr. at 200 deg., depending on volume of material. When the plastic is cured, the plaster is knocked off and the plastic sprayed with primer to the thickness of the

CORES formed in plastic molds are . . .



PERFECT when removed. Note slick finish.

metal of the part to be made. Later the first plastic casting is used for a mold in making its mating die. A parting agent prevents the two members from sticking together.

Plastic tooling at Lockheed is produced with readily-available material. Plastic enables the manufacturer to produce a great variety of tools at substantial savings in material and production time. Former construction required material that is critical today, expensive in cost. Long hours of grinding and polishing time are eliminated because the casting is just as good as the face of the mold to which it is cast. Principal material used at Lockheed for plastic tooling is a phenolic resin known as R-72S or Tool-Plastic, developed by the Rezolin Co., Los Angeles.

In the past two years Lockheed has used 197,000 lb. of phenolic plastic, replacing more than 1,800,000 lb. of Kirksite.

▶ **Where Used**—Specific parts made with plastic tooling at Lockheed include:

- Skins for P2V wingtips, drawn on a plastic double action die, using a Kirksite pressure plate. Left and right hand parts are formed in one operation, saving fabrication subassembly and assembly time.
- Spherical section of aircraft nose skin formed on an Erco press. With a plastic die, part is made in 25% of the time required when Kirksite was used, largely because Tool Plastic can be ground 6 times as fast as Kirksite.
- Complete assembly tools for fabrication of air intake ducts on jet fighters, double action draw dies, master models, drill and assembly jigs. The company says that overall costs are cut 25%, and tooling is completed in 50% of time required for similar projects using conventional metals.
- Fiberglas radomes, 5 ft. in diameter, made on a thin-wall plastic mold costing $600, replacing a Kirksite die costing about $5,000. Parts formed on the plastic mold had consistently better surface finish.
- A large one-piece liner for the P2V

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nose door, formed on large plastic double-action draw die. Plastic eliminated need for shrink patterns and saved 1,500 manhours of grinding and finishing required by old method.

▶ **Rejection Small**—Use of plastic double-action draw dies represents one of the major developments in plastic tooling, according to Lockheed manufacturing research engineers. A double-action die of Tool-Plastic can be produced for the same cost as a metal drop hammer die. Loss of parts through rejection amounts to only 5% with a double-action, whereas the loss factor with a metal drop hammer die amounts to 20%. Lockheed is now conducting successful experiments with drop hammer dies made of plastic. Replacement of metal drop hammer dies release scarce material for other uses.

Lockheed's plastics shop has made more than 135 double-action dies, 30 stretch press dies, 10 hydropress dies and about 6 experimental drop hammer dies. Labor savings in making dies out of plastic instead of Kirksite amount to between 40 and 50%. Material costs are about the same.

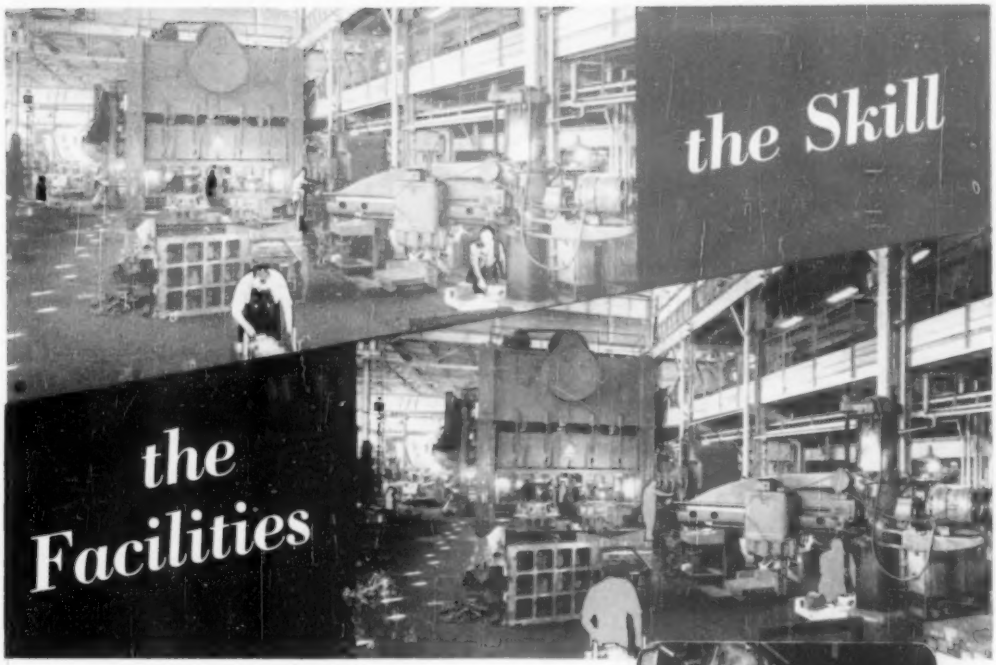
▶ **Quick Makeup Time**—Other advantages include the adaptability of plastic to large dies because of its lighter weight, which makes these large tools practical to handle. A plastic die can be cast on a single shift in the shop and be ready for use in 48 hr. under normal conditions because of savings in molding and grinding. Lockheed made 42 plastic double-action dies for L-94 air duct tooling in 90 days. As an example of Lockheed's manhour labor savings, the first unit of a typical die was made in 855 manhours and a second one in 770 hr. A comparable piece fashioned out of Kirksite would have entailed a minimum of 2,000 hr., Lockheed estimates.

Large plastic dies can further speed production by using them for stamping out several parts in one operation of the press. Examples of this time saver are found in a die that turns out four Constellation stabilizer fillets at one blow, and a larger die that delivers two large tail fillets per stamping.

A major advantage of Tool-Plastic over Kirksite, reports Lockheed, lies in the fact that breaks or cracks in plastic dies can be repaired overnight by a very simple patching process, whereas a damaged metal die becomes a total loss.

Other uses of plastic tooling at Lockheed in addition to making dies are found in a wide variety of applications such as master molds, Keller blocks, router and shaper fixtures, drill jigs and cages, scribe and trim fixtures, etc. Master molds made of plastic are much more durable than plaster and cost very little more to construct.

▶ **Savings Cited**—An example of savings made possible through plastic con-

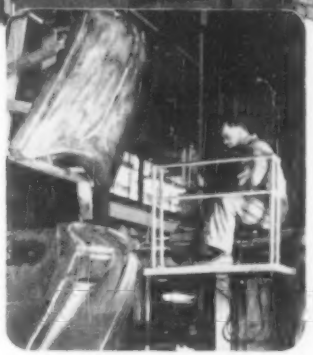


. . . to Build Every Type of

SHEET METAL DIE

The 1000 ton press shown in the background of the above illustrations is one of a number of tryout presses of varying capacities in operation in Richard Brothers Division die shops. This particular press, with a bed measuring 120" by 204", has capacity for tryout of extremely large dies. Many other types of equipment, including ten duplicating machines, give Richard Brothers the facilities to produce sheet metal dies of virtually every size and type.

Here, too, are the men who know how to use this equipment — men with years of experience and proven ability in die design and die building. When Allied equipment and manpower go to work for you, you can be sure of dies that will give you maximum production and economy.



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PLANT 2
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PLANT 3
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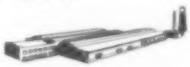
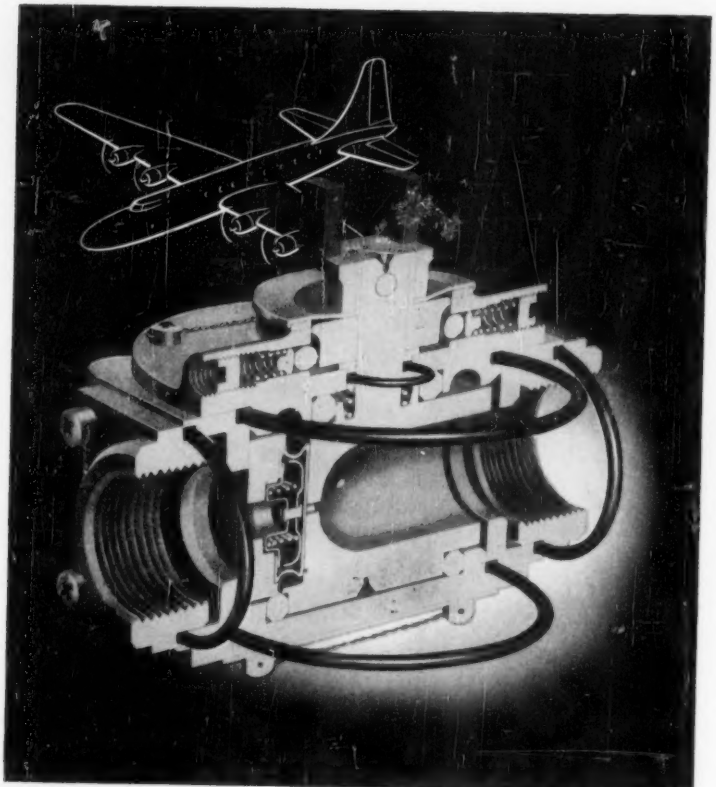


PLANT 4
Hillsdale, Mich.



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struction of molds is found in the mold built for the F-94B radome. Cost of the plastic mold was $6,197. A Mehanite mold would cost $20,480 for the first one produced. A second would cost $9,920. Cost of a second plastic mold is estimated at $1,237, because further tooling was not required.

Most plane parts require four or five basic tools, such as overpress templates, router blocks or shaper blocks, main forming tool and drill jigs. All can be made almost entirely from plastic or plastic-treated materials such as glass cloth laminates, many incorporating Tool-Plastic.

Router fixtures save time and expense when made of plastic and are made directly from the part to be duplicated. Drill jigs are easy to build, because they can be cast against a part or assembly, and are light in weight.

"Slave" parts are made for mockup use, saving time in waiting for working units and the loss of expensive units due to damage in handling.

A plastic core, with Kirksite cutting edge for trimming, was developed to replace a wooden form router block. With it, 150 parts were processed in 1¼ hr., with negligible loss. The old method took 40 hr. with 20% rejects.

The utility afforded by plastic tooling in speeding production, plus the accompanying saving in critical materials, leads Lockheed to anticipate greatly expanded application of plastics in the future.

S. N. Bean, Lockheed's chief tool engineer, reports that with few exceptions, application of plastics to tooling is virtually unlimited.

▶ **Another Application**—Another West Coast manufacturer also reports benefits stemming from the use of Rezolin's Tool-Plastic. AiResearch Mfg. Co., a division of the Garrett Corp., forms plaster cores for impeller blades in molds made of the plastic. These new molds, says AiResearch, have yielded an increase of over 1,300% in parts produced per tool, as compared with dental stone molds which formerly were used.

Maximum number of parts obtainable from a set of stone molds was about 1,500. Using plastic molds, the company has produced over 20,000 cores to tolerances of .005 in. with no dimensional change in the parts, and no sign of mold wear being evident.

Cost of producing the cores with stone is figured at $16 per hundred, while with the plastic molds the cost is about 1¢ each.

Minor repair of the plastic surfaces can be done with non-highly-skilled labor in a short time, whereas replacement of a set of stone molds, AiResearch reports, called for 1¼ days of work by skilled tool personnel.

Smoother surface finish of the plastic is another production advantage,

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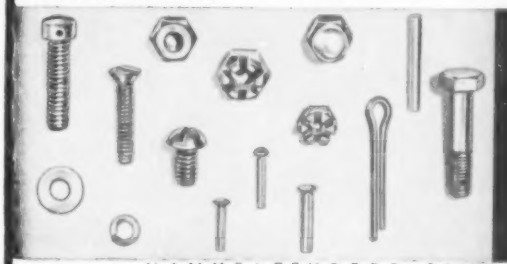

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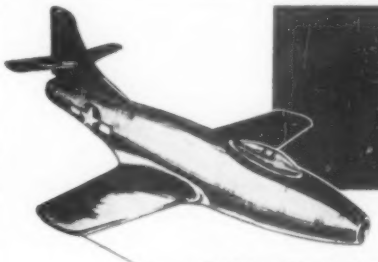

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the company says. Sterene, the medium of separation used in the casting process, must be applied to stone molds after each cast, while plastic molds give three or more cores before regreasing is necessary.

90% of Aircraft Workers in Unions

Nearly 90% of the 250,000 aircraft production employes are represented by a union. About two-thirds are under contracts of the International Association of Machinists, AFL, and one-third are represented by the United Automobile Workers, CIO. Less than 1% are represented by other unions.

This is reported in a new Bureau of Labor statistics survey of union bargaining contracts in the aircraft industry.

▶ **The Survey Shows:**

• **Holidays.** Six holidays with pay are customary.

• **Vacations.** All workers get them, usually two weeks.

• **Escalators.** Wages of 20% of the unionized workers are adjusted quarterly in accordance with the General Motors formula—one cent an hour (up or down) for each 1.14-point change in the BLS Consumers' Price Index.

• **Annual Improvement.** Half the employes under the wage escalator also get the General Motors type four-cent "annual improvement" increase to compensate for increased productivity.

• **Sick leave.** Three out of four aircraft workers (including all on the West Coast) get some paid sick leave.

• **Insurance.** Most insurance and pension plans include group life insurance and hospitalization and surgical benefits.

• **Arbitration.** All aircraft contracts call for arbitration of disputes over application of a contract. A few arbitrate wages and other contract terms.

• **Merit.** One-fourth the employes get automatic increases based on length of service; the others get increases based on merit.

• **Wages.** Average hourly earnings more than doubled from 75 cents in 1939 to $1.62 in 1950. By last October they had reached $1.80.

• **Jobs.** From 122,000 at the start of the Korean war aircraft production employment rose to 151,000 in October, 1950, and to 170,000 in December, 195. By last October employment had reached 250,000.

Vote Against Union

Piasecki Helicopter Corp. production maintenance and inspection employes last week voted against being represented by United Auto Workers, CIO, in an NLRB election, by a vote of 548 to 548. Over 92% of eligible voters cast ballots.

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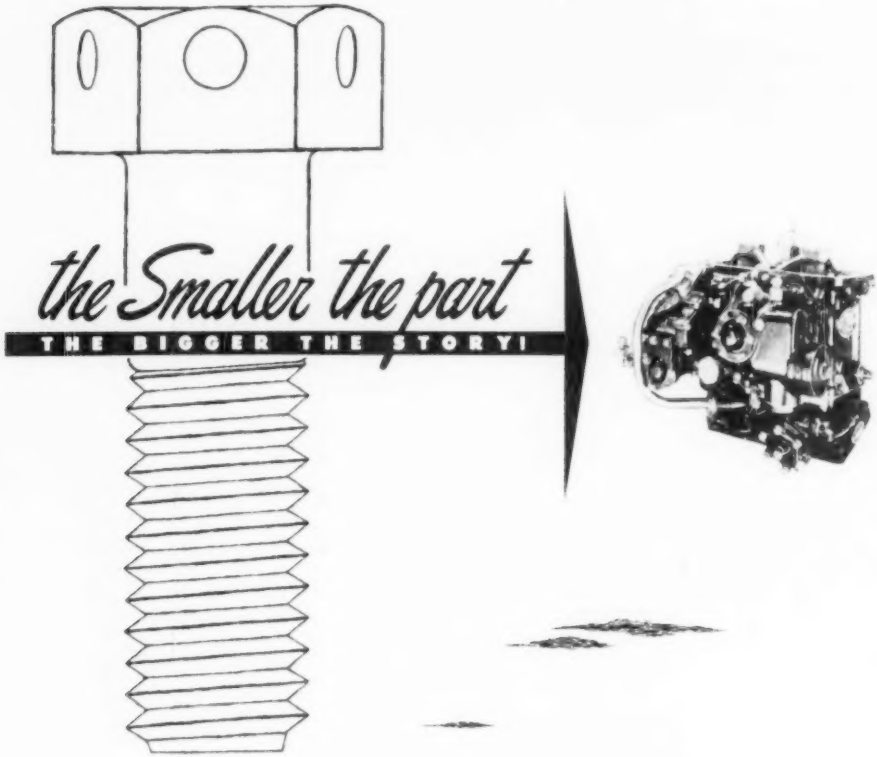

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WAL PROGRESS, from Douglas M-2 (above) in 1926 to Convair 240 (below) today, DC-6B later.

WAL Sticks to Periodic Overhaul

Nation's 'oldest airline' believes its system allows greater plane availability than 'progressive' method.

By George L. Christian

Los Angeles—There is a rebel against the general airline trend toward progressive overhaul.

Western Air Lines, bucking the precedent set by such large carriers as Pan American World Airways and such small outfits as Frontier Airlines, sticks firmly to its guns that periodic overhaul is the more economical and efficient maintenance procedure—at least for its particular purposes.

▶**America's Oldest**—WAL, which prides itself on being "America's oldest airline" (celebrated its twenty-fifth anniversary last year), claims that periodic overhaul allows greater aircraft availability, and the same overhaul jobs can be accomplished in less manhours.

Overall result is that you save money because the airplanes fly more and therefore earn more. And you use fewer men to do the same amount of work.

Here is WAL's aircraft overhaul summary:

• **DC-3 (fleet of 10)**—Overhaul period: 11,000 hr. requiring 10 work days and 22,000 m/h.

• **DC-4 (fleet of 10)**—Overhaul period: 10,000 hr. requiring 12 work days and 35,000 m/h.

• **240 (fleet of 5)**—Overhaul period: 7,000 hr. requiring 12 work days and 30,000 m/h.

Utilization figures for the same three aircraft respectively are 10:38; 8:45; and 7:30. Figures are based on the whole fleet, including ships in overhaul.

▶**Independent Airline**—Stanley R. Shatto, Western's vice president, operations, told AVIATION WEEK that since his company was the only major Convair 240 operator who did not subscribe to progressive or "pattern" overhaul, it had its own particular problems to solve.

Initial overhaul period for the 240 was a low 2,000 hr. The Civil Aeronautics Administration allowed WAL to increase this figure by 1,000 hr. at each overhaul period. The current period of 7,000 hr. will increase to at least 10,000 hr., Shatto predicted. And 12,000 hr. is well within the realm of possibility, he added. His confidence was based on the excellent condition of the 240's airframe as revealed at each major shakedown.

▶**Convair Modification**—WAL, like so many other Convair operators, is tackling the maximum gross weight increase modification. The first plane is in the works.

Simultaneously with this mod., Western undertook a vigorous weight reduction program. Harrison W. Holzapfel, the airline's manager, engineering, said that he had become somewhat alarmed at the gradual encroachment of weight-increasing changes made on the airplane. It seemed that every time a Service Bulletin was accomplished, the basic weight of the plane increased, never decreased.

Holzapfel estimated that 1,800 lb. had been hung on the airframe since the ships were originally delivered from Convair, and that's a lot of potential payload, especially for a twin-engined plane.

So Western is going through its Convairs with a fine tooth comb and removing every unnecessary item. Victims of the weight-saving campaign are augmentor tube extensions and "burp cup" holders. Total weight of the latter is only 3½ lb., an indication of the thoroughness of Western's program. It hopes to save a total of some 300 lb., equivalent to about two passengers.

▶**Smart Standardization**—Holzapfel pointed up two standardization programs WAL is undertaking for reasons of safety and economy:

• **Flight instruments grouping.** All of Western's fleet will have identical grouping of all flight instruments. Dual installations will be furnished, one for each pilot. Thus crew members, moving from one type of plane to another, will not have to readjust their reflexes to find the altimeter, air speed indicator, etc. Furthermore, considerable standardization of navigational equipment and aircraft component controls will simplify the crew's changeover job as much as possible. Result should be marked enhancement of safety.

All DC-3s and 240s have been standardized. DC-4s are in the process. WAL's five DC-6Bs on order will come delivered with the airline's instrument layout.

• **Engine modernization and standardization.** This program consists of: low tension installation on all R-2800 engines (parts are on order and expected momentarily); addition of two-position spark advance on all R-2800s (WAL has the Adel Precision Products system on order); conversion of the current R-2800 engines from the CA-18 model to the CB-16.

This latter move combines two advantages. First, all 240 engines will be

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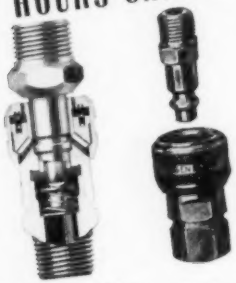

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ORIGINAL HANGAR at Los Angeles housed Western Air Express (predecessor to WAL) in 1926.

identical to those to be delivered with the DC-6Bs. This standardization between the two types of aircraft will save at least three engine spares, representing a sizeable investment. Secondly, the CB-16 engine should give the 240s better performance. Takeoff manifold pressures will be higher, high altitude characteristics should improve, and greater cruise power settings will result in higher speeds.

► **R-2800 Change**—While the subject of engines, Holzapfel spoke with pride of his company's cylinder change record on the R-2800. On its Convairs, the airline operates 4,600 engine hours per month per airplane (or a fleet total of 46,000 engine hours per month). From Jan. 1 to Oct. 1, 1951, only 53 cylinders were removed prematurely, or one per 7,700 engine hours.

► **Rugged Blanket**—Western is no longer plagued with augmentor tube troubles that tormented 240 operators when the plane was first put into service. WAL's solution was to wrap the tubes in stainless steel blankets which sandwiched a layer of Fiberglas between the outer coverings.

Now a fairly standard installation, Holzapfel said that WAL started on the project before Convair did. Working with the H. I. Thompson Co. of Los Angeles, who designed and built the blankets to the airline's specifications, WAL has found them to be quite satisfactory. Proof is that the original set, installed in November, 1949, has accumulated 4,600 hours and is still going strong.

Make-up of the blanket is this: both sides of a 2-in.-thick layer of Fiberglas are covered with .005-in. sheets of stainless steel. Blanket is compressed to a total thickness of approximately $\frac{1}{2}$ in.

Advantages are: The blankets give better insulation, they are lighter, cheaper and safer than previously installed blankets. Moreover, they eliminate wicking of the original installation.

► **Rugged Tail**—Western did not experience the siege of empennage component failures that beset 240 operators when the ships were first delivered. Airline officials attribute this to the fact that its 240s were the only Convairs delivered with the Martin 202-style retractable rear tail ramp.

This installation evidently altered tail vibration characteristics sufficiently to avoid the annoying rib cracking so many of the other operators experienced.

► **Two-speed Governor**—WAL engineers believe they have the solution to a problem relative to propeller pitch change with an electric control head on the 240.

With the control head now installed, the blades take from 8-13 sec. to go through full travel, according to airline officials.

This rapid pitch change makes it extremely difficult for the pilots to synchronize the props during flight. Even the slightest flick of the prop pitch change switch often causes the rpm. of one prop to go over or under the rpm. of the other.

So Western is testing a two-speed prop pitch control. The high speed side, used when large pitch changes are desired, will twist the prop blades slightly faster than the present control. The low speed side will move them at a much slower rate. This will make easier the hair-line adjustments required for accurate propeller synchronization.

The switch unit itself, a product of Airite Products Co., is a much more satisfactory, rugged assembly than the

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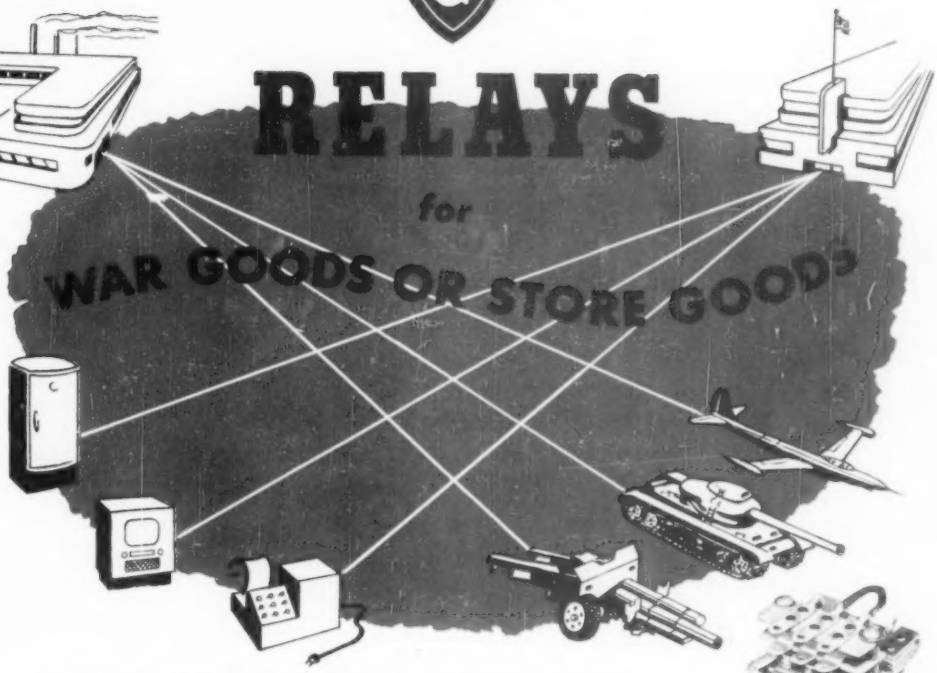

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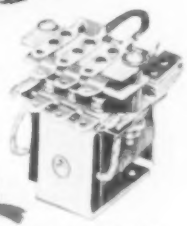

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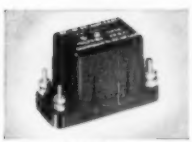

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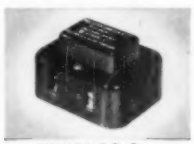

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original switch, say WAL's engineers. The test installation is working so well, they added, that they are going ahead with a fleet-wide installation. Also, Convair is considering the installation for the 340.

▶ **2,000-Hr. Supercharger**—"Western is the first AiResearch cabin supercharger operator to reach a 2,000-hr. overhaul period," Holzapfel said. "The compressor is an honest piece of machinery," he stated.

Western started doing its own cabin supercharger overhaul 1½ years ago and obtained approval for the 2,000-hr. overhaul period in September, 1950. Even at the 2,000-hr. figure, unscheduled removal rate of the unit is low, except for a run of hydraulic motor bearing failures.

Western has made a modification which, they say, has almost eliminated intermediate gear failure and resultant blower failure.

The mod. consists of installing an external line from the oil pressure manifold to the intermediate shaft. In this line they put a standard A/N paper filter to strain foreign matter from the supercharger lubricating oil.

▶ **Around the Shop**—Here are other items of interest noted in a tour of WAL's modern and spacious overhaul shops at Los Angeles International Airport.

• **To prevent flares** from rattling around in the chutes (located in the tail cone in Convairs), WAL has cemented two felt strips (¼x2 in.), spaced 4 in. apart around the flare. A 4-in.-thick, 4½-in.-diameter piece of sponge rubber was inserted between flare and door, while a strip of masking tape secures the static line tightly against the side of the flare to keep it from wearing holes. Final mod. was to attach the static line to the door with a clip to prevent it from pulling away. If the line pulls away the flare may not ignite.

• **Trend towards simplification**, so evident in many airline shops these days, is exemplified by Western's elimination of the oil cooler flap door and associated automatic control mechanism on Convairs.

• **Portable Scintilla** ignition analyzers will be used on the DC-6Bs (delivery to WAL starts in fall, 1952). The planes will come wired for the analyzer.

• **The airline is doing research** on instrument panel lighting. It has built up one panel consisting of a 5/32-in. sheet of Sierracin mounted on a regular metal panel. Report is that it gives excellent results.

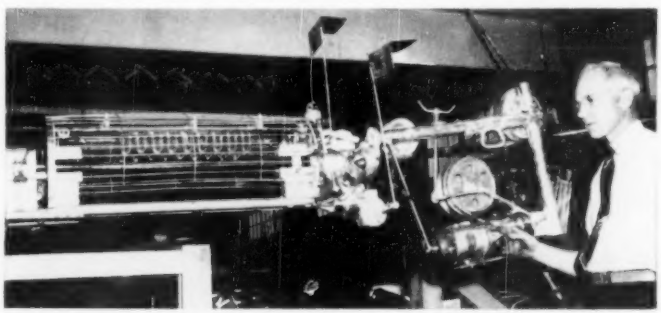
• **Strong on the western motif**, WAL is going to cover the baggage racks of its DC-6Bs with cowhide.

Western does a substantial fixed-base-operator business on the side. It furnishes complete overhaul services to Seaboard & Western (exclusive of airframe, which is done by the Flying Tigers). Other customers for through-station maintenance are Compania Mexicana de Aviacion, DC-3s and -6s; and Pan American World Airways, Constellations and Stratocruisers.

▶ **Twenty-fifth Anniversary**—Western Air Lines started its career as Western Air Express, in April, 1926. Fleet consisted of five Douglas M-2s which carried one passenger and cruised at 115 mph. Its original route went from Los Angeles to Salt Lake City via Las Vegas. Flying time was 8:25 hr. for the 670 miles.

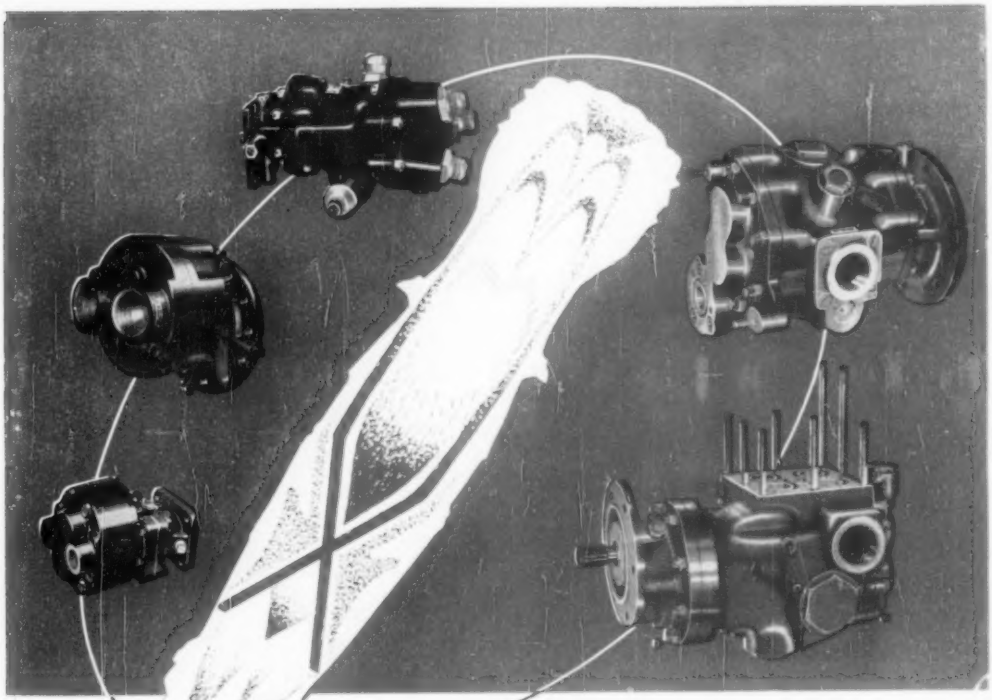
Today, the airline operates a fleet of 25 planes (exclusive of the yet-to-be-delivered DC-6Bs) over a 5,000-mi. system serving 45 cities. And, by contrast, the flying time, Los Angeles–Salt Lake City is only to 3:25 hr.

Western weathered a severe case of



SPOTS AIRWAY LIGHTS ON POWER LINES

This unusual light-and-motor device was developed to position airway lights on the far-flung 115kv. power transmission lines coming from the Grand Coulee Dam near Reardan, Wash. This is how it works: bar-type lights in wire housing are slung on power transmission lines; remotely controlled installation trolley propels light assembly out on electric cable to desired position, clamps light into position and returns for next lighting unit. Called "Airway Safety Light and Installing Trolley," project was directed by Washington State College in conjunction with Bonneville Power Administration.



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Ever since the emergency call came in 1941 for a failure-proof fuel pump that would stand up and deliver fuel to jet engines under conditions never before encountered, Pesco has paced the industry in the development of high-pressure fuel pumps.

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Today, every American jet engine in the air is equipped with Pesco fuel pumps. A few representative models are shown above. They range from the first simple, single element pump that produced 275 gph at 100 psi, to today's double element (main and emergency pump in a single housing) pump that delivers nearly 2000 gph at 1200 psi.

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"expansionitis" immediately after the last war, but now has pulled itself well into the black and, in common with the rest of the airline industry, faces the future with great confidence.

KC Airport Gets High-Intensity Lights

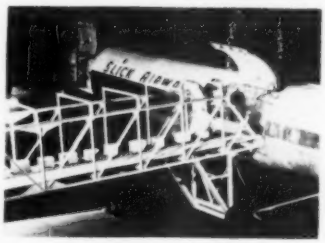
First commercial installation of Westinghouse high-intensity runway lights has been made at the Kansas City Airport.

A total of 67 of the new 200-watt lights stud the 7800-ft. instrument runway recently opened at the field. The units are fitted with 360-deg. lenses. Of the 67 installed, 12 are green threshold marker lights; 28 are equipped with 180-deg. yellow filters and 27 have clear lenses.

Besides the main task of outlining the landing strip, each light throws about 1000 candlepower on the "off-runway" side. Optical system of the lamps consists of a one-piece prismatic globe that does the work previously accomplished by a system of reflectors and circular lenses.

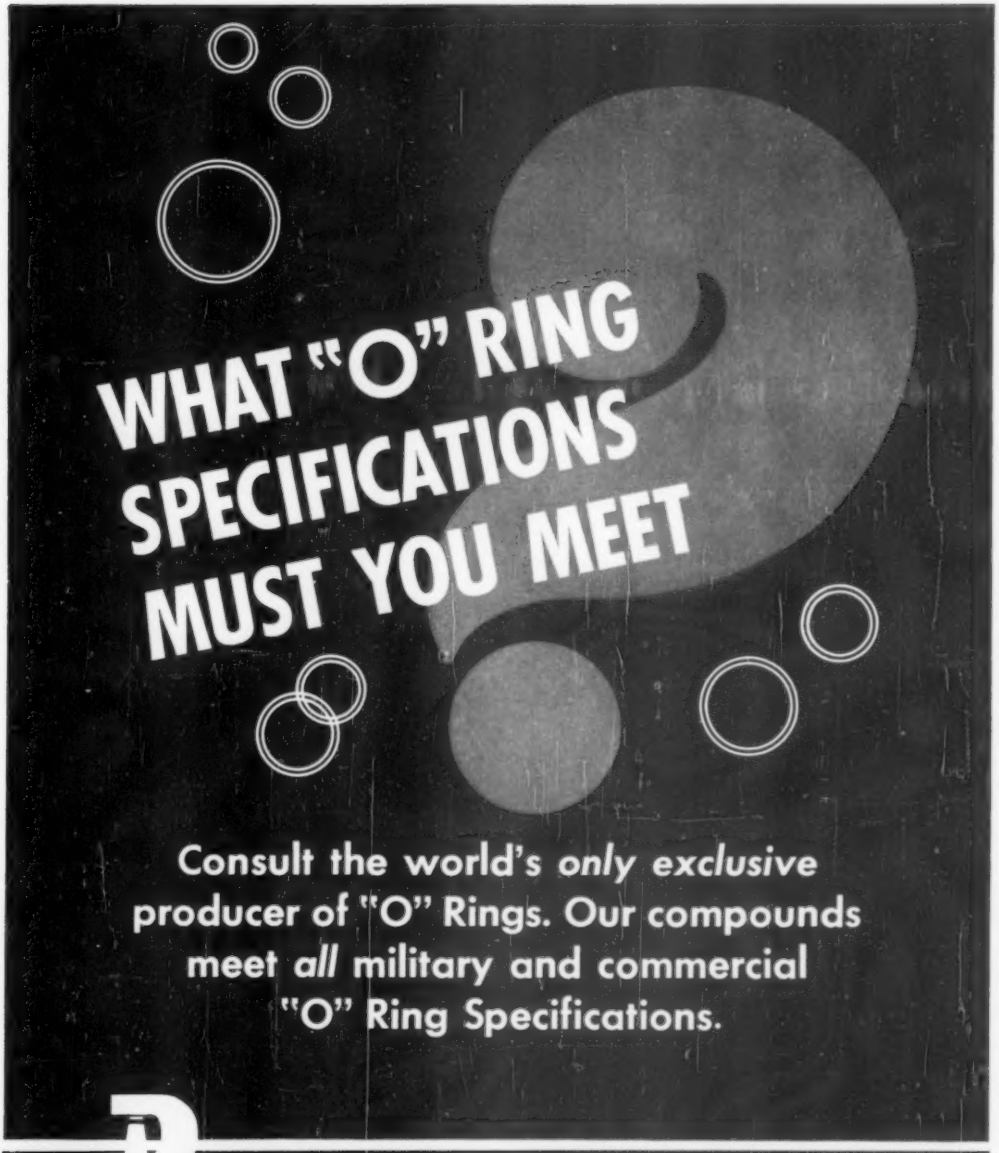
A.C. Power Supply

United Air Lines has solved the problem of getting single-phase and three-phase power to the electric motor-driven machines at its San Francisco Overhaul Base. The airline has installed a three-phase, 120/208 v., 4-wire bus duct system to feed the motors, according to the manufacturer, Westinghouse Electric Corp.



AUTOMATIC RAMP

Slick Airways says that this new, automatic loading ramp at its Newark terminal cuts loading and unloading time on its giant DC-6As and C-46s by one-half and labor required by one-third. It used to take five hours to load a DC-6A; with conveyor belt 2½ hr. have been lopped off. This saving enables the airline to speed up schedules and offer faster freight delivery. Cargo is hauled up the 50-ft. ramp by a 30-in.-wide rubberized conveyor belt. Maximum weight for a single piece is 1,000 lb. A walk-way parallels the belt. Airline plans improved versions at other terminals.



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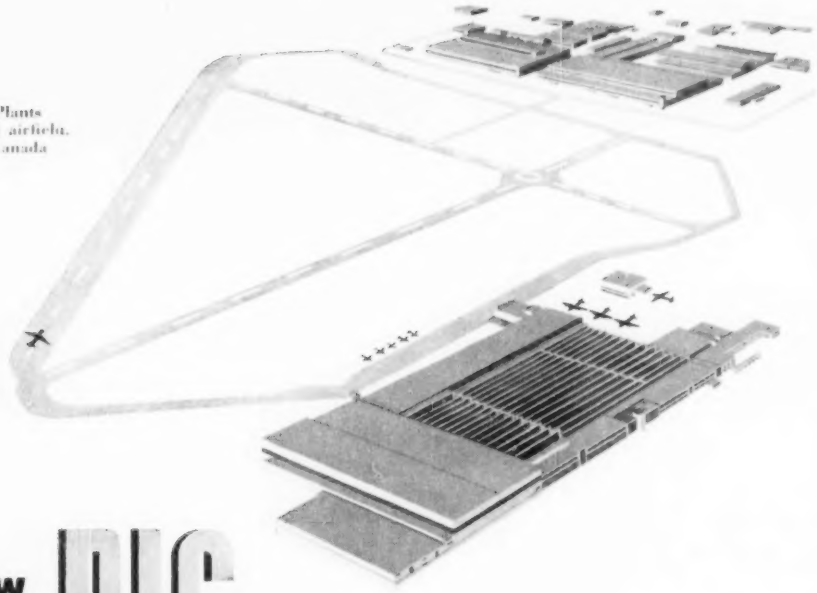

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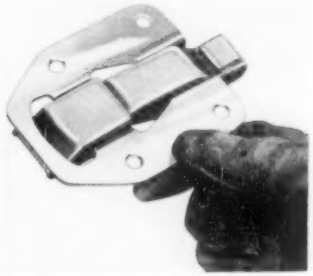


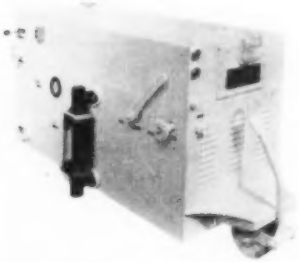
Aircraft Latch

A sturdy flush latch for use on interior and exterior surfaces in aircraft under rugged service conditions has been placed on the market by Hartwell Aviation Supply Co.

Made of solid stuff, either heavy gage stainless, coated cold rolled steel or heat treated aluminum, the latch is a heavy-duty type and has a trigger large enough to permit it to be opened with gloved hands.

It opens only when a substantial direct pressure is applied, thus guarding against accidental release from vibration or light loads. The bolt in the unit contains a spring loaded button that allows for variations in closure contact and misalignment. The latch is available in many combinations of trigger and bolt offsets, assuring a flush surface through a wide range of material thicknesses, the company says.

Hartwell Aviation Supply Co., 9035 Venice Blvd., Los Angeles 34.



Power-Pump Package

A hydraulic power package suitable for testing aircraft equipment and useful as an emergency standby, is a late development of the Rucker Co.

The unit, a heavy-duty, portable type mounted on wheels, can be operated wherever electric power is available and is set up for towing. The rig meets Joint Industry Conference specifications, the maker says.

Models are available with fixed-volume pumps in a wide range of sizes up to 60 gpm. at 2,000 psi. Unit shown has a 75 hp. output, developing 32 gpm. at 3,000 psi. Specific job requirements up to 5,000 psi. and 75 hp. can be met.

Multiple valves and simple hand control of two pressure lines permit the pump to take fluid from a built-in 100 gal. tank or from an outside source, adding to the versatility of the unit. It has a micronic filter, relief valve, flowmeter, pressure gages, electric controls and other necessary equipment. It weighs about 3,750 lb.

The Rucker Co., 4228 Hollis St., Oakland 8, Calif.

Locking Dowel Pin

A slotted, hollow metal dowel, called the "Sel-Lok Spring Pin," which compresses as it is driven into the hole, gives strong resistance to vibration, but can be used over again. It has been placed on the market by Self Lock Fastener Corp.

The pin, made both in standard and light-duty types, has chamfered ends, permitting it to be inserted with ease and speed, says the maker. It can be removed with a drift punch.

The part is heat-treated. It can be reused because of ability to resume original diameter after being compressed. Pins are low cost and only normal production hole tolerances are required for its use, the company says.

Self Lock Fastener Corp., 259 Stephens St., Belleville, N. J.

Hi-Temp Plane Ducts

An improved flexible ducting that withstands extreme temperatures and can be used for piping air to cabin ventilators, de-icers, engine intakes, breathers and superchargers in aircraft, has been announced by Flexible Tubing Corp., Guilford, Conn.

The product, called "Flexflyte," can be used in high- and low-pressure systems, is lightweight, resists flames and fumes and temperatures from —70F to 625F, according to the producer. An important feature simplifying stocking problems: it can be cut to length on the job with simple tools.

Flexflyte eases installation problems too, the company points out, as it can be bent back on itself on a radius of one-half its diameter with no more than a 10% reduction of inside diameter.

The ducting consists of a glass fiber

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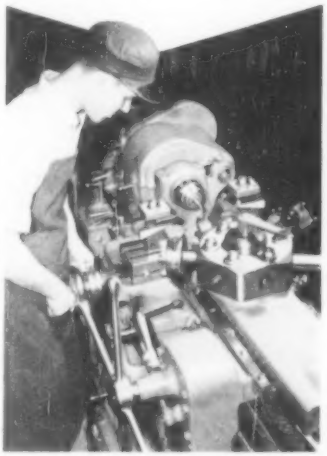
for Exacting Operations



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fabric cemented to a steel spring helix, all bound together with glass fiber cord, then bonded with a special elastomer compound. Present sizes range from one to four in. diameter. Special sizes, specially shaped ends and after-coatings to meet specific needs also can be provided, the company explains.

Flexible Tubing Corp., Guilford, Conn.

Driver Holds Screws

Avionic and other mechanics fumbling with tiny screws in tight places among tubes, terminals and other gear may find their difficulties reduced by using a new screwdriver which locks the screw to the blade.

The tool, developed by Hunter Tool Co., looks like any other screwdriver, except for a locking pin in the center of the blade tip. Slight pressure causes this pin to rotate and firmly lock (or bind) the blade tip in the screw slot. The locking pin extends through the full length of the blade and the tip may be ground to meet special needs or re-ground when worn and still retain the locking feature. It helps prevent stripping of screwheads.

R. N. Hunter Sales, 3499 E. 14 St., Los Angeles 23.

ALSO ON THE MARKET

Precision snap action, long life and high rating at low cost are said to be combined in the new Tyniswitch. The unit weighs 17 grams, fits in where space is scarce. Sessions Clock Co., Forestville, Conn.

Anchor bolts for factory machines reportedly can be set easily, quickly and safely in any type of concrete by using "Por-Rock Quick Setting Cement." Product replaces critical lead and sulphur for most bolt-setting operations, is applied cold. Hallemite Mfg. Co., 2446 W. 25 St., Cleveland 13.

Sheet-handling truck, has 6,000-lb. capacity, seven compartments each 42 in. wide for stock. Unit can be used over wood block or concrete floors, can be hand- or tractor-loaded. Market Forge Co., Everett, Mass.

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Jack & Heintz regularly engineers into special-purpose electric and hydraulic actuators such features as brakes, disconnects, emergency drives, automatic positioning, and torque-limiting clutches.

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Some of the advanced design features of Jack & Heintz actuators include brazed commutator connections and elimination of banding wire on armatures. The ingeniously designed torque-limiting clutches, incorporating 10 years of research and development on both materials and lubricants, provide long wear, ease of adjustment and minimum weight.

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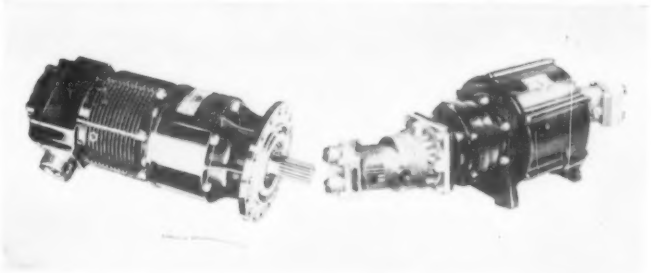
These features, and many others, can be designed into either electric or hydraulic actuators engineered to your needs.



NO SUCH THING AS A TYPICAL J&H ACTUATOR—The units shown here are special-purpose actuators built by working closely with our customers' engineers. The rotary actuator on the left is electric. That on the right is hydraulic. Each represents the successful solution of specific problems.

Chief Engineer's Corner

One section of our Engineering Department is devoted solely to the design and development of actuators. This section is staffed with some of the most competent of all of our mechanical and electrical engineers. Men assigned to this section are carefully screened to make sure that they have a genuine interest in aircraft, since a knowledge of the actual airplane requirement is of prime importance in the design of actuators.

Many times we find that it is next to impossible to define all of the requirements for actuators by specification, and we then send our engineers to the airplane plant to see the actual installation, discuss requirements with the customer's engineers, and get an actual "feel" of the job to be done. Sometimes we end up with a bigger job than our customer originally intended, and produce an actuator design that takes on a larger portion of the airplane system than the first inquiry, and thereby eliminate other assemblies and simplify the over-all system.

In other instances, we find that an actuator built to the specification does not make for the reliability, ease of maintenance, etc., that we know our customers would want, even though these factors are impossible to fully cover by specification. In a matter of hours, our design engineers can be, in your plant, discussing the details of an actuator design with your engineers. With them, they carry a wealth of experience on torque-limiting devices, gearing, mechanisms, brakes, etc., all of which can be put into a design especially for your application.

In addition to knowing what we can do, they also have many years of experimental work on thousands of research and development programs, so that they are aware of the unsuccessful experiments which can save you many headaches in the future. They will give you honest answers to your questions, rather than glowing promises dreamed up to sell you a J&H product.

These engineers are as close to you as your telephone. We'll be only too glad to discuss your actuator problems with you. Write JACK & HEINTZ, INC., Dept. 105-A, Cleveland 1, Ohio.

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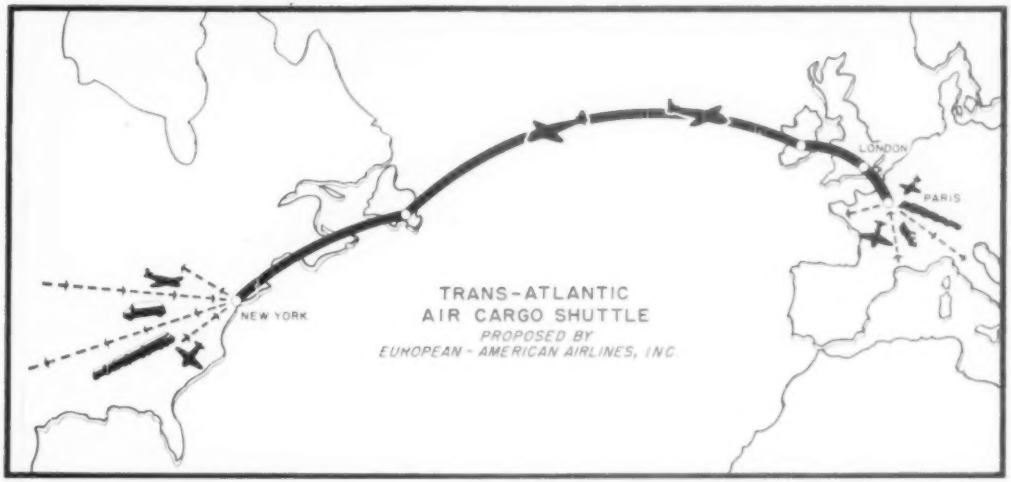


All-Cargo Carrier Asks Atlantic Route

- **European-American Airlines wants to operate as a non-subsidized auxiliary to present carriers.**

- **But CAB examiner is not sure how to classify EAA proposal to establish Atlantic shuttle service.**

A dark horse entered the race for U.S.-European airline routes last week at the CAB trial examiner's hearing of the trans-Atlantic route renewal case.

Most airline attorneys and government officials concentrated on the Trans World Airlines application and argument urging the CAB and the president to eliminate Pan American World Airways competition in Paris and Rome.

And the new entry, a proposed trans-Atlantic all-cargo airline operation called European-American Airlines, got little attention at first in the attorney and CAB counsel exhibits. But European-American, though not flying anywhere today, already has financing, equipment, maintenance and personnel commitments in the event of government approval of its proposed business enterprise.

President of European-American is Theodore T. Ludlum, currently chief of a Washington, D. C. investment firm. His background includes: graduation as a mechanical engineer from Rensselaer Polytechnic Institute; manufacture and sale of industrial lift trucks and other manufacturing enterprises; and in World War II a commander with naval air transport service in charge of trans-Atlantic cargo operations including Navy contract operations of U. S. trans-Atlantic airlines.

Initial financing of the company includes: $117,255 individual private subscription upon issuance of a CAB certificate; plus up to $1 million commitment of public stock issue by Gearhart, Kinnard and Otis of New York; plus equipment trust financing commitment for financing plane purchase by the same investment firm.

▶ **Asks Certificate**—European-American's route application is consolidated in the PanAm-TWA route renewal case. It asks a certificate for non-subsidized all-cargo service to operate an exclusively trans-Atlantic service supplementary to the mixed passenger-cargo business of PanAm and TWA as well as many foreign flag carriers.

European-American proposes to fly an air cargo shuttle from one major point in Europe to one major point in the U.S., primarily. New York-Paris is the preferred route. Baltimore and Frankfurt are the proposed co-terminals. Alternate terminal points are proposed, depending on CAB preference and diplomatic considerations on the subject.

Main argument of European-American, however, is that it would be a pure trans-Atlantic shuttle, devoted to generating air cargo business from the hinterlands to the trans-Atlantic route. It would not be a route system. It would collect cargo at the two trans-Atlantic terminal points from U. S. and foreign airlines, as well as from train, truck and freight forwarder services. Basic pattern of European-American's proposed route system is shown in the map.

▶ **Like Tiger, Slick**—European-American considers its route certificate application analogous to those of the domestic all-cargo airlines, Flying Tiger Line and Slick Airways, certificated by the CAB a few years ago. They are non-subsidized all-cargo operators whose specialization on air freight business appears to have boosted the freight business of the chiefly passenger airlines, such as American, TWA and United.

European-American President Theodore T. Ludlum has just returned from a survey tour of his proposed European air freight market. He asserted that even at current air cargo rates there is a big untapped air freight market.

He says the trans-Atlantic foreign and U. S. flag carriers have of necessity concentrated so intently on passenger business that the cargo potential is lying fallow. This occurred in the domestic air freight market until specialized all-cargo operators Flying Tiger and

Slick came in and devoted their efforts to generating air cargo business on a non-subsidized paying basis.

▶ **Finds Support**—Ludlum says that freight forwarders in Europe handle a major portion of the freight transport business. He says those with whom he talked on his recent survey universally endorsed his proposed specialized trans-Atlantic air cargo operation.

When he proposed a rate reduction from the present average 42 cents a ton mile to the European-American proposed 33 cents with C-54s and later 25 cents with DC-6As, the freight forwarders estimated they could use considerable more trans-Atlantic air cargo service than they are now, Ludlum says.

▶ **The Hearing**—Last week before the hearing of the PanAm-TWA-European route case, the entire TWA route application and most of the exhibits were on the question of TWA vs. PanAm. PanAm's exhibits were almost entirely defending the present PanAm and TWA route structure against the TWA proposed changes. But the PanAm exhibit devotes a short space to European-American's route application.

Fundamentally, PanAm charges that EAA's cost estimates are too low and revenue volume estimates are too optimistic. PanAm says the EAA indirect and ground expenses are lower than average costs of the certificated domestic all-cargo airlines. EAA answers that it has only two major ground stations to operate, with a long air route between, and low overhead—hence the low indirect and ground cost.

▶ **Load Factors**—PanAm also says that International Air Transport Assn. reports indicate average all-cargo flight load across the Atlantic runs at less than 70% of plane capacity, as compared with EEA's estimate of 60-75%, depending on the stage length.

To this, EEA answers that a specialized all-cargo operation would have a better cargo load experience than do the passenger airlines; it also argues that, being non-subsidized, EAA would schedule cautiously; three scheduled flights a week are tentatively slated for the start.

Trial Examiner Francis W. Brown, chief examiner of CAB, says he's not sure how to classify the European-American proposal, but, he says, it appears somewhat similar to the trans-Atlantic route applications of Seaboard and Western and Transocean.

However, European-American says its proposal is much different from those of Seaboard and Transocean. First, it is not a complex route system with the attendant cost, competition and overhead; it is a two-terminal shuttle only. Second, EAA would operate a definite schedule that freight forwarders, airlines and other shippers could count on always.

▶ **A Precedent**—A European-American spokesman also points out that so far CAB has made no determination of whether there's a need for an international, exclusively all-cargo operation similar to the domestic one of Slick and Flying Tiger.

But, he notes, many observers expect the Board to certificate at least one of the two all-cargo applicants, Skyfreighters Airways and Aerovias Sud, in the Latin American Air Freight case. That would set a favorable precedent for the important trans-Atlantic route question, EAA believes.

But until the examiner hearing date last week neither the big airlines nor CAB had paid much attention to European-American's application. Considerably more attention is anticipated by EAA before the deadline for CAB and Presidential decision of the trans-Atlantic route case this July.

▶ **European-American's Case**—Here are some of the basic arguments EAA planned to make at the hearing of CAB Examiner Brown last week:

• **EAA would not injure** the business of PanAm and TWA appreciably, says EAA; therefore there's no reason why it should not be allowed to try its proposed operation since it would risk only the EAA stockholder investment, not public money or public welfare, EAA reasons.

Here are EAA's arguments supporting this contention: the trans-Atlantic air freight shuttle would give slower freight service than PanAm's and TWA's direct service from origin to destination. EAA's proposed business is of limited scope; and it actually depends on U. S. and European air carriers to collect and distribute much of its air cargo outside the two main terminal cities of its shuttle route; also, primary interest of the U.S. flag carriers is passenger business; and finally, domestic experience indicates the all-cargo carrier has no real impact on combination passenger-cargo airlines, EAA finds.

• **Maximum development** of air cargo business can only come from specialized cargo promotion and service, EAA believes. Mixed passenger-cargo operation, with passengers dominant, leads to dilution of management attention, especially when subsidy is present, says EAA.

• **The U.S. is behind** foreign flag carriers on trans-Atlantic air freight business. While U.S. flag airlines handle about 60% of trans-Atlantic passengers, they haul only about 35% of the air cargo, EAA says.

• **Cartel pricing by** the International Air Transport Assn. forces an artificially high price that will never develop air cargo properly, EAA claims. Every IATA member must approve a proposed air cargo rate, and the rate they all agree to becomes the one and only rate. European-American, not belonging to IATA, would act as a pacer for the industry, pioneering the most economic free-market price for trans-Atlantic air freight.

• **Diplomatic simplicity.** EAA certification would require diplomatic negotiation for entry to essentially only one foreign city; on the other hand, CAB certification of an all-cargo applicant for a normal international route pattern would require involved negotiations with several countries.

• **Broad market.** EAA would draw business from all of Europe, whereas other airlines do business generally only in the areas restricted to their routes, EAA says.

• **The EAA route.** Application is in line with the President's and CAB's policy calling for competition on those routes that can stand it. The trans-Atlantic run is the highest density long-range international route, EAA

BRANIFF'S NEW TICKET SALON

A new style in selling passenger tickets amid luxury and comfort has been set by Braniff International Airways in its new office in the Columbus Hotel, Miami, Fla. Note the abstract mural of Braniff routes on the wall at far left.

says, and should support one all-cargo operator if it supports two somewhat competitive U.S. passenger lines.

• **U. S.-Europe economic and defense** integration is an avowed major aim of U.S. foreign policy, EAA points out. Air cargo becomes more and more necessary, then, to permit rapid shipment of parts and plans for integrated production schedules of ECA, NATO, and other programs.

• **All-cargo operating plans** using three C-54 roundtrips a week, EAA proposes trans-Atlantic air freight rates averaging about 33 cents a ton mile compared with a present average of about 42 to 43 cents, according to EAA estimates.

Using the figure of 300 ocean crossings the first year of operation, EAA estimates revenues and expenses as follows, based on 75% utilization of available ton miles on the critical over-ocean leg at charge of 33 cents a ton mile:

Freight revenue from 6,575,400 ton miles would yield $2,169,882 for the year or $291.26 per flight hour; direct operating expense would be $1,551,922 or $208.31 an hour; indirect operating expenses would be $486,732 or $65.33 an hour; this would leave an operating profit of $131,228 for the year or $17.62 an hour.

That's using the obsolescent C-54. But European-American plans to buy DC-6As; using the DC-6A, European-American figures it could cut prices and increase profit per unit as well as total profit because of the superior efficiency of the new plane. Using the DC-6A, EAA says it could ultimately drop its trans-Atlantic air cargo rate to about 20 cents a ton mile, based on Douglas Aircraft Co.'s cost estimates for the plane.

▶ **Revenue, Profits**—Annual revenues at 20 cents a ton mile, with 75% of available ton miles utilized on the critical leg for 300 crossings (12,476,250 ton miles) would be $2,495,250 a year or $598.38 an hour, direct operating expenses at Douglas-estimated 10.3 cents a ton mile are figured at $1,291,616 a year or $309.74 an hour. Indirect operating expense would be about $714,932 a year or $171.45 an hour. This leaves total operating profit of $488,702 a year or $117.19 an hour.

In terms of revenue and expense per ton mile with the DC-6A, European-American figures it could operate at only 16.1 cents a ton mile while taking in revenues of 20 cents a ton mile. This leaves operating profit of almost 4 cents a ton mile.

European-American reports these estimates will be revised shortly on the basis of actual DC-6A experience of Slick Airways, reportedly not far different from the original Douglas estimate.

PanAm Orders Fleet Of 29 DC-6B Coaches

Pan American World Airways has ordered a fleet of 29 DC-6Bs to be delivered as air coaches direct from the Douglas factory, an informed source has told AVIATION WEEK.

All 29 are slated for trans-Atlantic coach service. Of the 29 coaches, 20 are a new order. PanAm previously ordered 18 other DC-6Bs, nine of them in the 82-passenger air coach configuration, making a grand total of 38 DC-6Bs on order.

Observers consider this the first decisive indication that a truly mass air transport industry is firmly established by some scheduled airlines for the future.

Previously, all air coach development has been hesitant and slow by comparison. Airlines have acquired coach transports piecemeal by converting older planes from luxury to high-density seating. And no other airline has yet announced such a sweeping coach expansion plan as PanAm's order for 29 new coaches implies.

A PanAm spokesman estimates that this fleet of 82-passenger coaches will be able to carry over 150,000 people a year across the Atlantic.

▶ **Coach Developments Elsewhere**—There were these other coach developments around the world:

• Foreign airlines at the International Air Transport Assn. conference at Nice also decided to try coach within Europe, as well as across the Atlantic. Intra-European fare cuts will range to 42½%.

• And, following U.S. coach expansion plans announced by American, National, TWA, United and Western, capital airlines has proposed to start a New York-Atlanta night coach.

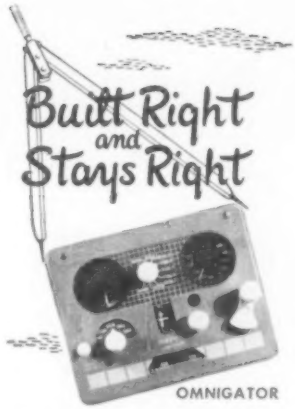
▶ **More PanAm Plans**—To advertise trans-Atlantic air coach PanAm is sending a coach DC-6B to cities throughout the U.S. between now and May 1—the starting date for the service. The plane's arrival in each city will be heralded by heavy promotion activities.

Qantas Airways Shows Half-Million Profit

(McGraw-Hill World News)

Melbourne—Enterprising Qantas Empire Airways has shown a net profit of nearly $500,000 during its last fiscal year.

In addition, the Australian carrier has increased its route mileage more than 5,000 miles to about 38,000 miles and has added to its aircraft fleet one Constellation, two Short Sandringham flying boats and a de Havilland Drover. Qantas has also ordered a Super Connie.



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Set Probable Cause Of Southwest Crash

CAB finding on the probable cause of the Southwest Airways DC-3 crash Apr. 6 near Santa Barbara, fatal to all 22 aboard, is: "failure of the flight, for undetermined reasons, to maintain the specified minimum enroute night altitude of 4,000 ft. for the route being flown."

Investigation showed the plane, its altimeter and it radio aids were apparently operating properly. The plane was in level flight at cruising throttle. But it was at 2,740 ft. Yet the pilot had flown this route 1,300 times before; and he was on a leg of only 60 miles from Santa Maria to Santa Barbara, so the Board rules out any probability of the plane's being lost.

If he had maintained proper minimum altitude of 4,000 ft. the pilot would have been above a cloud layer with top of 3,500 ft. so the inference is that he purposely decided to descend below the minimum.

Only hypothesis the Board has is that the pilot was overconfidently trying to duck under the cloud cover to take a slight short cut. He had been 15 min. late leaving San Francisco and 12 min. late out of Santa Maria. "This fact may well have had some bearing upon the pilot's attempt to make up time, particularly as another company flight . . . was following him . . . ," CAB concluded.

Air Safety Record Holds Steady in 1951

CAA Administrator Charles F. Horne says the 1951 air safety record of U.S. carriers was "good" and estimates that the rate of passenger fatalities of domestic and international airlines together just equaled the previous year at 1.3 per 100 million passenger miles flown.

It was 1.4 per 100 million passenger miles domestically and 1.2 internationally.

This represents a slight increase from 1950's domestic record of 1.2, but a considerable improvement over 1950's international fatality rate of 2.1.

Horne implies that although safety improvement should have been expected in a normal year, sharply increased airline operation in 1951 tended to increase the accident exposure rate per passenger mile.

▶ **Civil Aviation in 1951**—In a year-end summary of civil aviation the past year, Horne also noted that:

• **Manufacturer self-government** increased, under CAA sponsorship of a plan for lightplane makers to certificate their own planes—as Piper and Cessna did in 1951.

• **Agricultural flying gained** 10% while number of agricultural planes in service gained 15%.

• **CAA re-shuffled** its safety office organization.

• **Research progress** included a new stall-recovery technique, transport passenger evacuation study, and decompression effects.

• **Economic studies** of note include the comprehensive British turbine transport development study, under direction of Harold Hockstra; and the Air Coordinating Committee helicopter policy.

• **DPA-approved** annual production quota of 3,500 light civil planes a year.

• **A CAA survey** found that 80% of active non-transport civil planes "are engaged primarily in activities useful to the national defense."

• **First nine DME** ground stations went into experimental operation on the New York-Chicago airway.

• **Scheduled airline passenger** traffic gained 32% domestically and 22% internationally.

CAB to Continue Nonsked Restrictions

The Civil Aeronautics Board will continue penalizing nonscheduled airlines that fly with a frequency beyond legal limits; there will be no change in CAB interpretation of its flight frequency ban on the nonskeds.

That's the gist of a letter from CAB Chairman Donald W. Nyrop to Senate Small Business Committee Chairman John J. Sparkman. He says that the ban will go on at least until CAB finishes its recently started investigation of what to do about nonskeds.

"We do not believe that the operating authority of such carriers . . . should be expanded," Nyrop says. After completion of the investigation, figured to last up to a year, their operating authority may be "expanded or contracted."

New KLM Services

(*McGraw-Hill World News*)

Cairo—A new weekly Constellation service to Sydney, Australia has been opened by KLM Royal Dutch Airlines, touching Cairo, Jakarta (Indonesia), Biak and Darwin.

After the war, KLM did not re-establish its regular passenger service to Australia since heavy emigrant traffic to that country absorbed as many as two chartered planes weekly.

The Dutch carrier also is inaugurating a new service to Tokyo, bringing the number of countries it serves to 61. This run will pass through Beirut, Lebanon. Passengers using this service can go to Beirut by utilizing Mistair, or else go by KLM to Bangkok and there pick up the Tokyo service.

SHORTLINES

▶ **Air France** flight crews took a novel pilot strike tack when they quit work Dec. 19 with the announced intention of staying off for just 20 days unless they get a satisfactory wage offer.

▶ **Air Transport Assn.** is expanding its research department.

▶ **Air Navigation Development Board** "summary progress report" is now available from ANDB, CAA-W9, Bldg. T-4, 17th and Constitution Ave., Washington, D. C., says the ANDB technical staff, which resigned after finishing the report: "It defines a foundation on which an economical and satisfactory common system can be built." . . . Expects to announce soon it has found a new technical director, former Director Douglas H. Ewing and all the technical staff but one (Henry R. Senf) resigned last summer.

▶ **Boston's Logan Airport** this week gets the long-awaited subway service extension from downtown Boston. The $17-million extension starts in Scollay Square, goes under the harbor to Maverick Square, then to the airport station and on out. Bus shuttle will carry passengers the mile from subway station to airport.

▶ **British European Airways** has presented manufacturers with specifications for a commercial helicopter design. It should initially carry 30 passengers but go up to 45 as powerplant and other parts improve, according to BEA.

▶ **British Overseas Airways** New York-London Stratocruiser service ran a 93% load factor in November, compared with the previous BOAC record of 81% for the same service last March.

▶ **Capital Airlines** final mail rate is now set by CAB at 53 cents a mail ton mile retroactive to Oct. 1. This is a "compensatory, non-subsidy" rate, CAB says.

▶ **Central Airlines'** mail pay would be 80 cents a mile from Oct. 1, 1951, to Apr. 30, 1952, and 65 cents thereafter, according to a CAB show-cause order.

▶ **Chicago & Southern Air Lines** mail rate is set by CAB at $1.45 a mail ton mile, estimated to bring $1,045,000 annual mail revenue a year, 20% under the past rate. New rate is retroactive to Oct. 1, 1951.

▶ **Civil Aeronautics Board** plans to pub-

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a pretty girl

It is a commendable thing, indeed, for a young lady to arise bright and early on New Year's day to compose her good resolutions. However, there's a limit to how far one should go in such matters, and we heave a sigh of relief that Barbara Phillips has decided to strike out that last entry on her list. She is 21, has green eyes and brown hair, likes to fly, and raises Boxer dogs.
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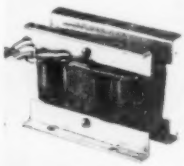

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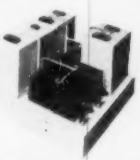

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Design and Manufacture of Electrical Timing Devices

lish an up-to-date manual of the "Uniform System of Accounts for Air Carriers," which has been piling up modifications since Jan. 1, 1947. The manual will include all changes up to Oct. 1, 1951.

▶ **Eastern Air Lines** is putting its 40-passenger Martin 4-0-4s on scheduled passenger routes as extra sections as the planes are delivered.

▶ **Major Air Coach System,** nonscheduled airline of Burbank, Calif., belly-landed a C-46 transport in a field near Coburg, Ontario, with no injuries to the 50 aboard. Plane was reportedly off course on a Burbank-Newark flight. One engine went out over Lake Ontario; the radio went out; the plane was losing altitude; then the other engine quit.

▶ **Mexico** and the U. S. again have failed to agree on a bilateral air transport treaty. U. S. wants Mexico to adopt the Bermuda principles, agreed to by most other airline nations.

▶ **Mid-Continent Airlines** says there will be no final decision on whether to merge with Continental in the immediate future, but the idea is under study. CAB recently urged them to merge.

▶ **National Airlines** still is waiting for Cuban permission to start the non-stop New York-Havana route granted it by CAB. Cubans say the similar reciprocity grant by CAB to Cubana, PanAm affiliate, is more restricted than National in its New York route certificate . . . reports a 14% gain in revenue passenger miles for November.

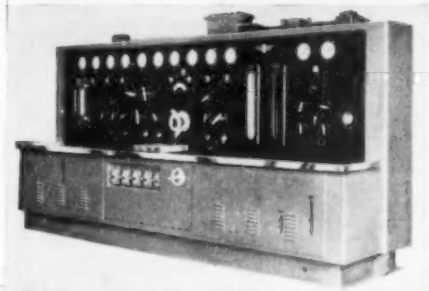
▶ **Newark Airport** runway realignment has begun with award of the first paving contract; paving begins Feb. 15.

▶ **Northwest Airlines** reports load factors on the new Japan Air Lines (JAL) are running over 80%; NWA is doing the flight operation for the airline. . . . Has resumed air mail service to Korea. . . . Reports the November load factor at 63%, compared with 49% a year ago; total passenger miles were up 28% to 48,076,166.

▶ **Philippine Air Lines** has won traffic right London-Madrid-Rome in a new treaty with Spain and planned to start operations last week.

▶ **Railroad and Airline Wage Board** plans hearings early next month to consider recommended changes in present stabilization regulations. Present Regulation No. 1 adopts about 20 of the outstanding regulations and orders of the Wage Stabilization Board and Salary Stabilization Board.

GREER AIRCRAFT FUEL BOOSTER PUMP TEST STANDS (upper left) are shown installed in National Aircraft Maintenance Corp., Newark, N. J. These machines test external and submerged type pumps, measure flows up to 3600 pph and pressures up to 100 psi. Operate 12 or 24V dc up to 30 amps.



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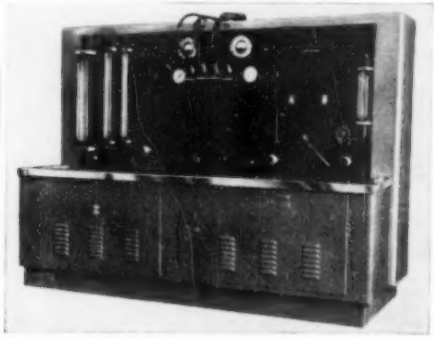

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42	SF5RN-12 (manufacturer's part No. 10-26170-1)	Bendix Scintilla Magneto
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814	35814	Blower Ass'y
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175	48363	Shaft
56	48399	Sump
390	48461	Gear
78	76236	Gear
1178	84289	Bearing
113	84487	Housing
77	84591C	Nose Housing
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28000	KS6A
34600	NR6L12
7000	38KD4
6600	RE3MR3
5000	F35-14

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Quantity	Part No.
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160	490 DY
26	550 CD
14	550 CG
195	550 CP
104	550 EC

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Quantity	Part No.	Mfg.	Description
45	AN4103-2	Clifford	Brass (Valve # U4785)
38	18597-2	Airesearch	Aluminum (Width 8") (Length 9")

PUMPS

230	MF9-713-15A	Vickers	Hydraulic
75	AN6102-1(8818-2)	Adel	Fuel
160	2E492E	Pesco	Fuel
700	TFD 8600	Thompson	Fuel Booster
125	D7818	Adel	Anti-icer
50	9P771-A	Pesco	Fuel Booster
250	AN4014	Erie Meter	Wobble (D-3)
300	1H960-K & KA	Pesco	Hydraulic

INSTRUMENTS

19	AN5531-1	G.E.	Tach. Generator
1000	AN5780-5	G.E.	Wheel & Flap Position Indicator
400	AN5780-2	Weston	Same as above
16	76B19	Lewis Eng.	Cyl. Head Temp.
10	46B2	Lewis Eng.	Air Temp. Ind.
31	47B21	Lewis Eng.	Temperature Ind.
12	47B22	Lewis Eng.	Temperature Ind.
20	47B23	Lewis Eng.	Temperature Ind.
36	47B24	Lewis Eng.	Temperature Ind.
10	76C2	Lewis Eng.	Air Temp. Ind.
11	76B4	Lewis Eng.	Temperature Ind.
20	77C4	Lewis Eng.	Temperature Ind.
21	77C5	Lewis Eng.	Temperature Ind.
85	727TY72Z2	Weston	Left Wing Anti-icing
88	727TY72Z3	Weston	Right Wing Anti-icing
83	727TY74Z2	Weston	Tail Anti-icing
11	2227-11D-3A	Eclipse	Dual Tachometer
22	8DJ-29-AAY	G.E.	Indicator (Cowl Flap)
45	2548K-6-052	Kollsman	Differential Pressure Ga.
25	906-6-011	Kollsman	Dual Altimeter and Differential Pressure Ga.
5	14601-1G-B1	Eclipse	Attitude Gyro
22	15100-1B	Eclipse	Pitch Trim Ind.
10	20000-8A-14	Eclipse	Magnesyn Position Ind.
23	20100-11C-4-A1	Eclipse	Magnesyn Wing Flap Ind.
40	23000-2A	Eclipse	Position Transmitter
25	46N2	Jaeger	24 Hour Clock

MISCELLANEOUS COMPONENTS

44	58A25DJ4B	G.E.	DC Motor (½ HP)
83	A4934	Delco	Motor
50	RD82220	Holtzer Cabot	DC Motor
49	FD65-5	Diehl	Motor
47	FD65-6	Diehl	Motor
116	A371205	Dumore	Motor
780	A371206	Dumore	Motor
115	P4CA2A	Parker	Primer
80	AN3213-1	Scintilla	Ignition Switch
450	A-9 (94-32226)	Nasco	Ignition Switch
687	RS-2	Mallory	Selector Box
90	JH950-R	Jack & Heints	Starter Motor
492	S-841 (94-32253)	Electronic Labs	Box
53	AN6203-3	Bendix	Accumulator 10"-1500 P.S.I.
1000	13018-A	Bendix	Interphone Box
140	K14949E	Marquette	Windshield Wiper Kit
188	EYLC-2334	Barber-Colman	Control
11	12086-1C	Eclipse	Amplifier
174	450-0	Skinner	Gasoline Filter
250	558-1A	Eclipse	Oil Separator
100	564-2A	Eclipse	Oil Separator
100	716-3A	Eclipse	Generator (NEA-3A)
37	117-47	Edison	Detector
89	318	Edwards	Horn
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340	981280	Kidde	Co2 Cylinder
85	12994-2	Adel	Lock Valve
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80	DW28	Eclipse	Transformer
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28	9655-D	Airo	Oxygen Regulator
22	M-2031	Air Associates	Actuator
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STRICTLY PERSONAL

SP LOST & SP REGAINED—Please don't read this column if you don't care for columns like this. It's being resumed after six months' hibernation. It's to appear every once in a while, only for those who asked for it. . . . At the height of the recent unpleasantness between PAA and Panagra, **Hugh Harvey** of Shell Aviation News poked his head in our office door with the flash that "Over in PanAm's executive dining room you can't even say Grace now." . . . We were in Washington reading one of **Katherine Johnsen's** stories she had just written for AVIATION WEEK and thought her typewriter had been stuttering. Miss Johnsen with her customary vigor and purposefulness dived for her favorite Directory of Bureaucracy and proved to us that the Navy not only has several Deputy Chiefs of Naval Operations, but that one's title is "Deputy Chief of Naval Operations (Operations)." It seems that the other Deputy Chiefs of Operations aren't concerned with operations at all.

* * *

BUT WHAT ABOUT C-46s?—**George Bounds**, luck at his old stand at Chicago & Southern as chief press chief, has sent out annual passes to his friends and clients. Rules and conditions governing use: "Not good on day flights. Not good on night flights. Not good on DC 3s. Not good on DC 4s. Not good on DC 6s. Not good on Constellations. Not good on Convairs. Not good on Martin 2-0-2s or Lockheed Lodestars. Just no damn good."

* * *

AVIATION GOT THE BUSINESS—If you've ever wondered what would happen if you put an airmail stamp on a legal letter, this will give you an idea. AVIATION WEEK's **George Christian** says an aviation friend of his in Manhattan put an airmail stamp on a letter destined for Idlewild Airport. Ten days later the letter reached the addressee at Idlewild, Jamaica, L. I., bearing the notation, "Missent to Jamaica, B. W. I."

* * *

KEEPING THE PASSENGERS INFORMED—Gilliland's **Dave Callahan** burst in to see us the other day looking like he'd been up all night. He had. It had started harmlessly enough in Montreal late the previous afternoon when he boarded a Colonial airliner for New York. The ceiling was down at LaGuardia so a certain amount of stacking and instrument approaching followed in slow progression. Some first-riders were finally delighted to get a beautiful view of LG but the pilot missed once, twice, three times. It took a long time and there were other and presumably better pilots waiting for this Colonial fellow. He was finally chased out of the area. Everybody aboard was pretty mystified. So the little stewardess rushed to her microphone and relieved everybody with this announcement: "Ladies and gentlemen. We have missed our approach at LaGuardia Airport and are now climbing back up out of the overcast. The pilot doesn't know what he is going to do next but I will let you know just as soon as he decides." (They wound up in Boston and took an all-night bus to New York).

* * *

I'VE BEEN STARVING ON THE RAILROAD—It's true, so help us. We got this one from Railway Progress magazine. In Chicago a man was arrested in a hotel lobby where he was busily tearing up timetables of the Gulf, Mobile & Ohio Railroad because he hadn't been able to get into the diner coming into town on one of its trains.

* * *

LEARN WHILE YOU LAUGH—We've been holding this sugar-coated nugget of knowledge, swiped from the Chicago Tribune. It was a teletype message sent from the Tribune's Washington office:

"ON LAST NIGHT'S QUERY ABOUT TARZON BOMBS, PENTAGON SAYS THIS IS CORRECT NAME, NOT TARZAN. THE TARZON IS LARGE VERSION OF THE RAZON, A SMALLER RADIO-CONTROLLED BOMB. DERIVATION OF RAZON IS "R" FOR RANGE, "AZ" FOR AZIMUTH, AND "ON" TO MAKE IT ALL SOUND LIKE A WORD. WHEN THEY CAME ALONG WITH ENLARGED BOMB THEY PUT IN A "T" IN FRONT OF RAZON AND SHIFTED IT AROUND TO SOUND MORE LIKE TARZAN OF THE APES. THE "T" DOESN'T STAND FOR ANYTHING."

* * *

HEIR AGE DEFINITIONS—Hy Sheridan sends along his latest definition: "Pregnant—heir conditioned."

* * *

ON THE SERIOUS SIDE—We sat beside NACA's **Doctor Dryden** during the Wright Day dinner in Washington the other night. The doctor, commenting on some people's contention that we must simplify our fighting planes, said it is like saying we could simplify our logistics by feeding our GIs rice. . . . We asked **Gen. K. B. Wolfe** how he liked civilian life. The response was enthusiastic. "I should have done it years ago." A lot of aircraft people would disagree. . . . That was a tough publicity break the Navy and Defense Dept. handed Kaman Aircraft Corp. None of the press releases or picture captions even mentioned the name of the firm that designed and built the new gas turbine shaft-powered copter. But Boeing was named as developer of the turbine.

—R.H.W.

WHAT'S NEW

New Books

Publication No. 1 of the Organisation Scientifique et Technique Internationale du Vol à Voile.

This report is a summary of the lectures held during the third congress of OSTIV, which is an international scientific and technical organization concerned with soaring flight, at Oerebro, Sweden, in July, 1950. Among the papers is a fascinating one on performance measurements of a soaring bird, the black buzzard.

This buzzard flies at a power loading of about 270 lb./hp. At its lowest soaring speed, it develops a lift coefficient of 1.57, rather high in view of the flight Reynolds' number of only 140,000. It can use its wingtip feathers as diffusers to increase its effective aspect ratio. Its minimum drag coefficient is 0.0058, which is only about six-tenths that of such a clean airplane as the Messerschmitt 163 rocket interceptor. And the author concludes that the bird has some means of controlling the flow over its body and wing and keeping that flow laminar. Fascinating reading.

Purchase from Mr. J. P. Hoog, Sec'y.-Treas. of OSTIV, Kanaalweg 3, The Hague, Holland. Price $0.75.

—DAA

New Publications

1950 Supplement to Screw-Thread Standard for Federal Services, superseding National Bureau of Standards Handbook H28 (1944), 113 pages, 17 series of tables, 17 series of figures, price 50 cents, order from the Government Printing Office, Washington 25, D. C.

This new supplement, directed by the Interdepartmental Screw-Thread Committee, makes effective numerous changes in U. S. screw thread standards adopted since the 1944 edition of this book.

The Unified standards for thread form, as signed by the governments of Canada, United Kingdom and the U. S., for the coarse-thread series in sizes ¼ in. to 4 in. and for the fine-thread series ¼ in. to 1½ in. appear in this new supplement. It also contains Unified special threads and American national diameter-pitch combinations not yet recognized as Unified standards, but for which allowance and tolerances have been formulated within the principles of Unified threads. Tables of tolerances, allowances and other thread data for threads of special diameters, pitches and lengths of engagement are also given.

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EDITORIAL

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Aeroplane is embarrassed by Aviation Week's "surprisingly naive (by our journalistic standards) word-for-word reproduction of some of the correspondence from de Havillands to the prospective operator," but Aeroplane says even this "leaves us with a good impression," although the "Hatfield sales team may blush for weeks at the very thought of their letters having been made public in this way—letters in which they let their hair down in matters of production policy, sales prospects and certification comments—but at least the hair appears to have been real hair and not the customary sales wig."

We think our readers like stories with real stuff in them, but what kind of stories do your readers want, Aeroplane?

—Robert H. Wood

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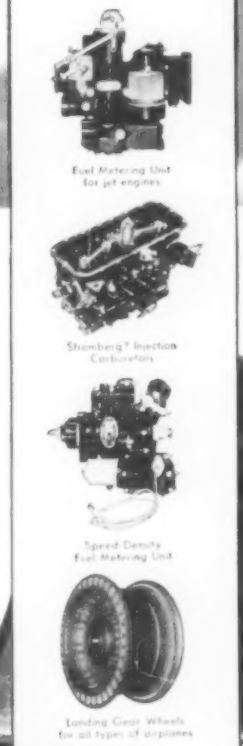

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STRICTLY PERSONAL

SP LOST & SP REGAINED—Please don't read this column if you don't care for columns like this. It's being resumed after six months' hibernation. It's to appear every once in a while, only for those who asked for it. . . . At the height of the recent unpleasantness between PAA and Panagra, **Hugh Harvey** of Shell Aviation News poked his head in our office door with the flash that "Over in PanAm's executive dining room you can't even say Grace now." . . . We were in Washington reading one of **Katherine Johnsen's** stories she had just written for AVIATION WEEK and thought her typewriter had been stuttering. Miss Johnsen with her customary vigor and purposefulness dived for her favorite Directory of Bureaucracy and proved to us that the Navy not only has several Deputy Chiefs of Naval Operations, but that one's title is "Deputy Chief of Naval Operations (Operations)." It seems that the other Deputy Chiefs of Operations aren't concerned with operations at all.

* * *

BUT WHAT ABOUT C-46?—**George Bounds**, back at his old stand at Chicago & Southern as chief press chief, has sent out annual passes to his friends and clients. Rules and conditions governing use: "Not good on day flights. Not good on night flights. Not good on DC-3s. Not good on DC-4s. Not good on DC-6s. Not good on Constellations. Not good on Convairs. Not good on Martin 2-0-2s or Lockheed Lodestars. Just no damn good."

* * *

AVIATION GOT THE BUSINESS—If you've ever wondered what would happen if you put an airmail stamp on a local letter, this will give you an idea. AVIATION WEEK's **George Christian** says an aviation friend of his in Manhattan put an airmail stamp on a letter destined for Idlewild Airport. Ten days later the letter reached the addressee at Idlewild, Jamaica, L. I., bearing the notation, "Missent to Jamaica, B. W. I."

* * *

KEEPING THE PASSENGERS INFORMED—Gilfillan's **Dave Callahan** burst in to see us the other day looking like he'd been up all night. He had. It had started harmlessly enough in Montreal late the previous afternoon when he boarded a Colonial airliner for New York. The ceiling was down at LaGuardia so a certain amount of stacking and instrument approaching followed in slow progression. Some first-riders were finally delighted to get a beautiful view of LG but the pilot missed once, twice, three times. It took a long time and there were other and presumably better pilots waiting for this Colonial fellow. He was finally chased out of the area. Everybody aboard was pretty mystified. So the little stewardess rushed to her microphone and relieved everybody with this announcement: "Ladies and gentlemen. We have missed our approach at LaGuardia Airport and are now climbing back up out of the overcast. The pilot doesn't know what he is going to do next but I will let you know just as soon as he decides." (They wound up in Boston and took an all-night bus to New York).

* * *

I'VE BEEN STARVING ON THE RAILROAD!—It's true, so help us. We got this one from Railway Progress magazine. In Chicago a man was arrested in a hotel lobby where he was busily tearing up timetables of the Gulf, Mobile & Ohio Railroad because he hadn't been able to get into the diner coming into town on one of its trains.

* * *

LEARN WHILE YOU LAUGH—We've been holding this sugar-coated nugget of knowledge, swiped from the Chicago Tribune. It was a teletype message sent from the Tribune's Washington office:

"ON LAST NIGHT'S QUERY ABOUT TARZON BOMBS, PENTAGON SAYS THIS IS CORRECT NAME, NOT TARZAN. THE TARZON IS LARGE VERSION OF THE RAZON, A SMALLER RADIO-CONTROLLED BOMB. DERIVATION OF RAZON IS "R" FOR RANGE, "AZ" FOR AZIMUTH, AND "ON" TO MAKE IT ALL SOUND LIKE A WORD. WHEN THEY CAME ALONG WITH ENLARGED BOMB THEY PUT IN A "T" IN FRONT OF RAZON AND SHIFTED IT AROUND TO SOUND MORE LIKE TARZAN OF THE APES. THE "T" DOESN'T STAND FOR ANYTHING."

* * *

HEIR AGE DEFINITIONS—**Hy Sheridan** sends along his latest definition: "Pregnant—heir conditioned."

* * *

ON THE SERIOUS SIDE—We sat beside NACA's **Doctor Dryden** during the Wright Day dinner in Washington the other night. The doctor, commenting on some people's contention that we must simplify our fighting planes, said it is like saying we could simplify our logistics by feeding our GIs rice. . . . We asked **Gen. K. B. Wolfe** how he liked civilian life. The response was enthusiastic. "I should have done it years ago." A lot of aircraft people would disagree. . . . That was a tough publicity break the Navy and Defense Dept. handed Kaman Aircraft Corp. None of the press releases or picture captions even mentioned the name of the firm that designed and built the new gas turbine shaft-powered copter. But Boeing was named as developer of the turbine.

—R.H.W.

WHAT'S NEW

New Books

Publication No. 1 of the Organisation Scientifique et Technique Internationale du Vol a Voile.

This report is a summary of the lectures held during the third congress of OSTIV, which is an international scientific and technical organization concerned with soaring flight, at Ocrebro, Sweden, in July, 1950. Among the papers is a fascinating one on performance measurements of a soaring bird, the black buzzard.

This buzzard flies at a power loading of about 270 lb./hp. At its lowest soaring speed, it develops a lift coefficient of 1.37, rather high in view of the flight Reynolds' number of only 140,000. It can use its wingtip feathers as diffusers to increase its effective aspect ratio. Its minimum drag coefficient is 0.0058, which is only about six-tenths that of such a clean airplane as the Messerschmitt 163 rocket interceptor. And the author concludes that the bird has some means of controlling the flow over its body and wing and keeping that flow laminar. Fascinating reading.

Purchase from Mr. J. P. Honig, Sec'y.-Treas. of OSTIV, Kanaalweg 3, The Hague, Holland. Price $0.75.

—DAA

New Publications

1950 Supplement to Screw-Thread Standard for Federal Services, succeeding National Bureau of Standards Handbook H28 (1944), 113 pages, 17 series of tables, 17 series of figures, price 50 cents, order from the Government Printing Office, Washington 25, D. C.

This new supplement, directed by the Interdepartmental Screw-Thread Committee, makes effective numerous changes in U. S. screw thread standards adopted since the 1944 edition of this book.

The Unified standards for thread form, as signed by the governments of Canada, United Kingdom and the U. S., for the coarse-thread series in sizes ¼ in. to 4 in. and for the fine-thread series ¼ in. to 1½ in. appear in this new supplement. It also contains Unified special threads and American national diameter-pitch combinations not yet recognized as Unified standards, but for which allowance and tolerances have been formulated within the principles of Unified threads. Tables of tolerances, allowances and other thread data for threads of special diameters, pitches and lengths of engagement are also given.

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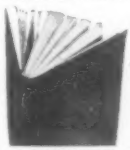

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Sometimes the keenly developed British sense of propriety encounters rough going when our British cousins deem it brutally necessary to translate something from the brusque American aviation press.

The Aeroplane admits that our story Nov. 26 about Overseas National's willingness to buy Comets "let several interesting cats out of Hatfield's prospective-Comet-sales bag." We were "primed in an extraordinarily thorough manner by an airline operator." Our operational weight break-down for the Comet "is only mildly off the mark" and "some direct-operating-cost figures . . . are valuable."

Aeroplane is embarrassed by Aviation Week's "surprisingly naive (by our journalistic standards) word-for-word reproduction of some of the correspondence from de Havillands to the prospective operator," but Aeroplane says even this "leaves us with a good impression," although the "Hatfield sales team may blush for weeks at the very thought of their letters having been made public in this way—letters in which they let their hair down in matters of production policy, sales prospects and certification comments—but at least the hair appears to have been real hair and not the customary sales wig."

We think our readers like stories with real stuff in them, but what kind of stories do your readers want, Aeroplane?

—Robert H. Wood

Bendix Products Division

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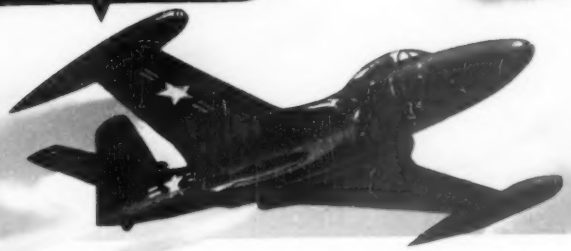

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